MARCH, 1955

ONE COPY SENT TO L. C.

CORROSION ISSUE

PIPE LINE INDUSTRY

© Gulf Publishing Company

CONSTRUCTION • OPERATIONS • MAINTENANCE

lew Developments

Some outstanding examples of how the pipe line industry has contributed to corrosion control advancements.

Page 40

ipelining Railroaders?

They own choice right-of-way. Will they become operators? Southern Pacific has announced $30 million project.

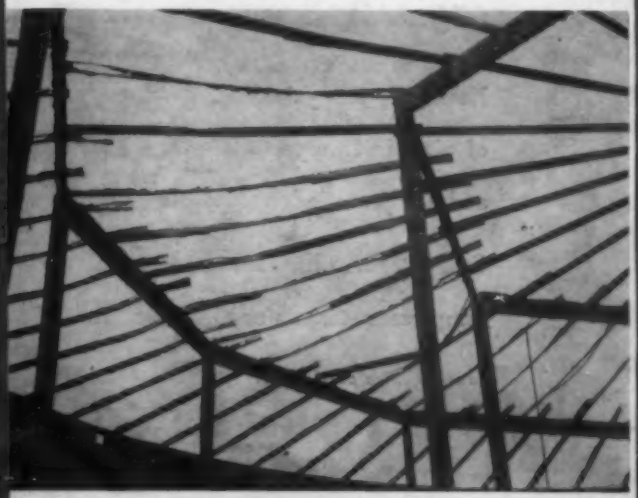
Page 90

conomics a Problem

The cost-conscious corrosion engineer must be ever aware of economics involved in the decisions he must make.

Page 54

HARPOON FOR TEST LEADS



CORRODED TANK TOP

Turn page for additional contents and a Quick Review of this issue

Subscription price $2 per year

Single copy price 50 cents

Single-operator compressor stations

featured in

New semi-automatic compressor station

Push-button Pipelines

engineered and built by Gulf Interstate Engineering Company

Nationally recognized for their streamlined approach to the problems of pipeline transportation, Gulf Interstate engineers have developed methods and equipment which materially reduce operating costs.

Gulf Interstate Engineering will contract to engineer, design or build pipelines, compressor stations or allied facilities any place . . . any time.

Your inquiries are invited.

Gulf Interstate Engineering Company

GULF INTERSTATE BUILDING • HOUSTON, TEXAS

MAR 14 1955 B 525277

PIPE LINE INDUSTRY

March, 1955 Vol. 2, No. 3

CONTENTS and Quick Review

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Why Pipe Lines Corrode

☐ The trouble all comes from the differences which set up battery action. This article lists the fundamentals.

By Maurice A. Riordan.....Page 36

New Developments Aid Corrosion Protection

☐ The pipe line industry has made outstanding strides in developing corrosion protection. Here are some of the outstanding examples.

Page 40

How To Combat Internal Corrosion

☐ The pipe line engineer faces many internal corrosion problems. Preventive measures must be chosen carefully to assure the most economical solutions.

By Russell A. Brannon.....Page 44

Start Corrosion Protection Before Line Is Laid

☐ A visual study by the corrosion engineer while a pipe line is still in the planning stage will save money. Future protection and maintenance costs will be cut.

By O. W. Wade.....Page 50

Economics Is a Basic Problem

☐ Virtually every decision that a cost-conscious corrosion engineer makes calls for another. And all of these decisions have an economic basis.

By Marshall E. Parker.....Page 54

How To Design Cathodic Protection Systems

☐ Designing a cathodic protection system usually starts with a guess. Then come tests. Then calculations. Here is a step-by-step process.

By Wayne A. Johnson.....Page 58

Corrosion Protection a Continuous Job

☐ Underground conditions change constantly as far as cathodic protection is concerned. Without efficient inspection and maintenance even the best protection system can fail.

By Henry Allen.....Page 66

NACE Marks First Ten Years

☐ Engineers from the pipe line industry organized the National Association of Corrosion Engineers and have remained active since in every phase of corrosion control.

By Melvin A. Judah.....Page 74

Who's Meeting Where..... 34
How to Do It—Pipe Line Hints..... 84
Pipe Line Construction..... 90
Pipe Line Industry's Views of the News..... 98
Rules of Thumb for the Pipeliner's Notebook..... 101
Pipe Line Men in the News..... 102
What's Happening Among Service and Supply Men..... 106
What's New in Equipment..... 110
New Equipment Literature..... 113
ADVERTISERS' INDEX..... 114

CORROSION ISSUE

THE PIPE LINE industry has played a major role in advancement of scientific corrosion control. Pipeliners first organized the National Association of Corrosion Engineers. And again this year, a man from the pipe line industry has been named recipient of the Frank Newman Speller award for outstanding contributions to corrosion control. (See Page 74).

But one of the continuing problems is keeping the industry informed of good corrosion protection practices. PLI is attempting to aid in the solution of this problem in this, our CORROSION ISSUE. Planned by seven of the top corrosion men in the industry, it was executed by authors who are experts in the field and PLI's staff.

On Page 83 are brief biographies of the authors who have contributed to this issue.

•

Melvin A. Judah has joined the editorial staff of PIPE LINE INDUSTRY as associate editor. He was formerly assistant editor in the Houston offices of *Chemical and Engineering News, Industrial and Engineering Chemistry* and the *Journal of Agricultural and Food Chemistry*. Previously, Judah served on the staff of the National Association of Corrosion Engineers. He prepared field reports on pipe line corrosion studies and assisted in the development of a punch card filing system for corrosion literature abstracts and also helped handle arrangements for several corrosion meetings, field trips and short courses. After four years with NACE, Judah was recalled to active duty with the Navy, serving two tours with the Seventh Fleet off Korea. He is a graduate of Texas A & M College.

Melvin A. Judah

PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

'An Evil Day Is Brewing'

The important considerations involved in the U. S. Supreme Court decision in the Phillips gas case are set forth with great clarity in a few paragraphs taken from a speech by Frank Porter, president of the American Petroleum Institute.

Not only what Porter said, but the clarity with which he said it is important. When talking to non-oil men, the following paragraphs of Porter's should be a part of the armament of every oil man, whether he be executive or roughneck:

"An 'evil day' is brewing for consumers of natural gas, and for the country as a whole, as a result of the now-famous 'Phillips decision' by the U. S. Supreme Court.

"Unless Congress acts immediately to reverse this court-made law, the result will be a sharply reduced supply of gas for consumers throughout the U. S. and, eventually, a drying up of gas supplies for interstate shipment.

"The Phillips decision extends the authority of the Federal Power Commission to producers of gas in the oil fields and rules, in effect, that these producers are public utilities.

•

"Can you imagine the thousands of gas producers, who do nothing but drill for and sell gas in the field, being subjected to all the controls of a utility company? The production of gas, of course, is no more a public-utility function than the production of coal or oil, or iron or wheat, or any other commodity.

"I can think of no better means of drying up the gas supply in this country than attempting to subject the gas producers to federal utility controls.

"I know from experience, as all others in the industry know, that the producers of gas cannot exist on a 6 percent return on the investment in their producing properties, without regard to losses incident to searching for and developing gas reserves. The average chance of drilling a well which produces any quantity of oil or gas is about one in nine. In addition, these chances are not only getting greater every day, but the cost of exploration is steadily increasing.

"Those who applaud federal regulation of the producer do so under the mistaken idea that they will get a regulated low rate for gas. Nothing could be farther from the truth. It is immaterial how cheap any commodity may be if the commodity is not available for sale.

"The wellhead price of gas is only a small fraction of the price paid by domestic consumers.

•

"Please do not misunderstand me. The inability of the operator to make his gas available for interstate sale under utility controls is not a producers' strike. The results here predicted are based solely on the simple proposition that the search for, and production of, gas cannot survive under utility controls.

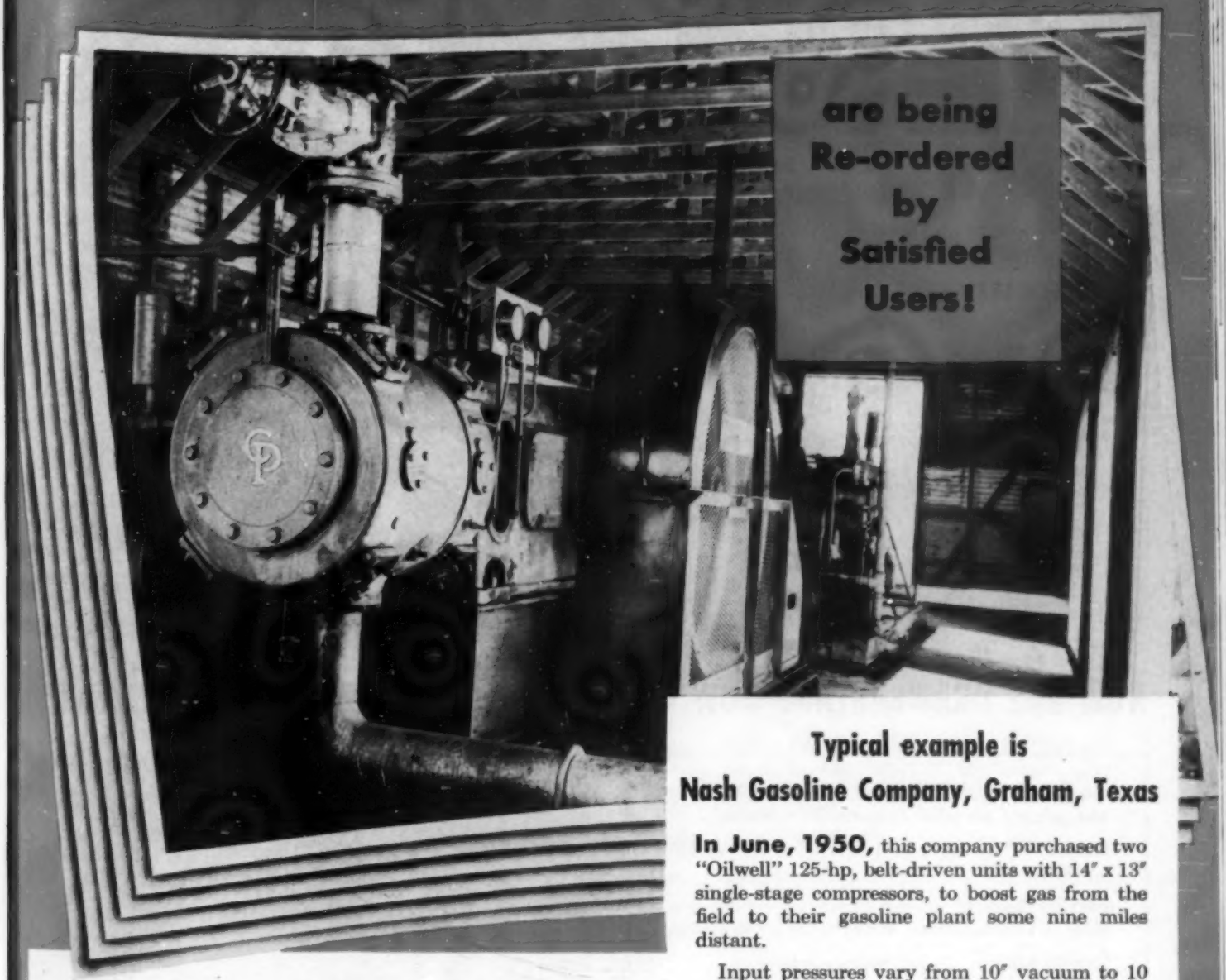
"It also follows, inasmuch as one-third of the gas going into interstate commerce is directly associated with the production of oil, that the country's supply of petroleum could be adversely affected.

"Federal regulation of producers' prices for gas is a long step in the direction of socialism.

"This great country of ours did not attain its world leadership in a strait-jacket of price regulation. The only assurance for a continued supply of oil and gas is the economic freedom to search for and develop new underground reserves under our traditional system of competitive enterprise. The liberty we cherish to produce and sell in a free market has given us the best way of life known."

Ray L. Dudley

MORE and MORE "OILWELL" GAS-COMPRESSOR UNITS



Typical example is Nash Gasoline Company, Graham, Texas

In June, 1950, this company purchased two "Oilwell" 125-hp, belt-driven units with 14" x 13" single-stage compressors, to boost gas from the field to their gasoline plant some nine miles distant.

Input pressures vary from 10" vacuum to 10 psi for this operation, and corresponding outputs are in the 60 to 75 psi range. Depending upon gasoline plant operations, from 650,000 to 1,000,000 cu. ft. per day of gas is handled by each unit.

According to Mr. G. R. Paull, Manager of Nash Gasoline Company, the consistently good performance which the company has received from these units, together with low maintenance costs throughout the three-year period these units have been in service, was directly responsible for their decision to re-order additional "Oilwell" units for their expanding facilities.

When you have GAS PUMPING Problems

. . . let your "Oilwell" Representative quote on the "Oilwell" Unit that meets your requirements most economically, throughout the 20 to 300 hp range.

OIL WELL SUPPLY
DIVISION
UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices— CALGARY, CANADA
CASPER, WYOMING . . . COLUMBUS, O.
DALLAS, TEXAS . . . HOUSTON, TEXAS
TULSA, OKLA. . . . LOS ANGELES, CALIF.

Branches Serving All Oil Fields

USS

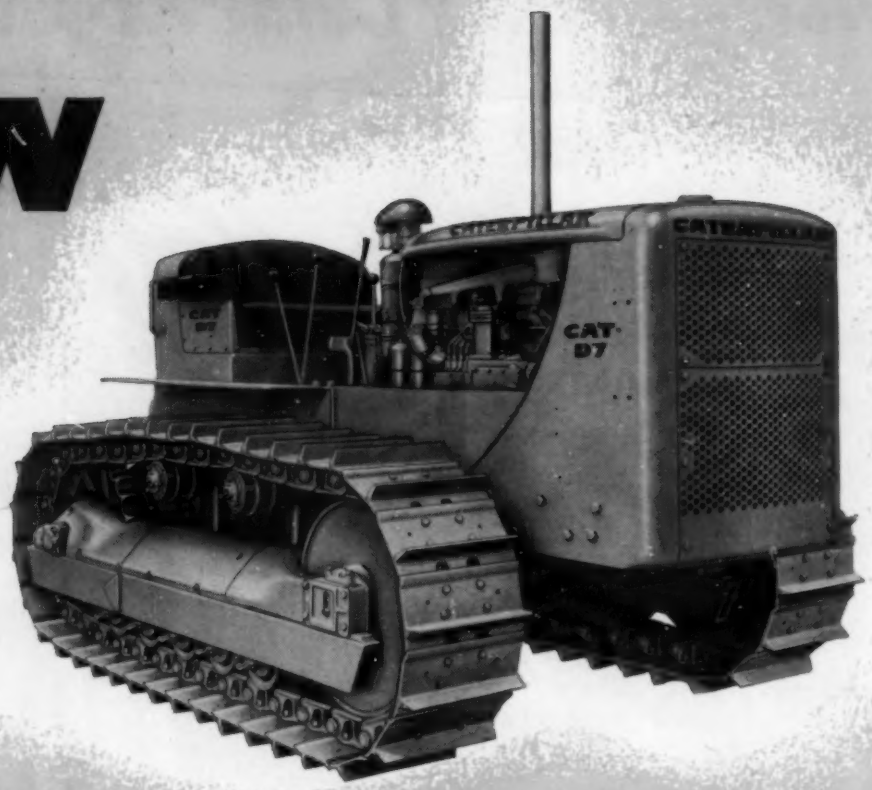
"OILWELL"

TRADE MARK

UNITED STATES STEEL

CATERPILLAR ANNOUNCES THE NEW D7 SERIES C

MORE POWER
SMOOTHER PERFORMANCE



NOW 102 DRAWBAR HP! NOW A VIBRATION BALANCER ON THE ENGINE!

Here's the new CAT Diesel D7 Tractor . . . latest example of Caterpillar Leadership in Action!*

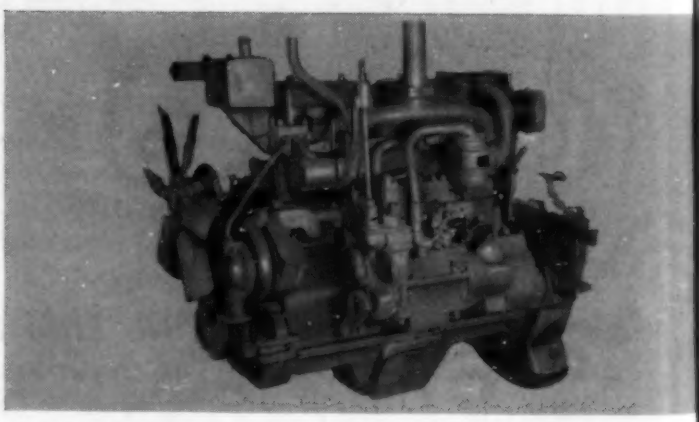
Drawbar HP increased to 102, engine HP to 128 (at 1200 r.p.m.).

Vibration balancer on the 4-cylinder engine now gives all the smoothness of 6-cylinder performance.

Drawbar pull now 28,700 pounds maximum.

New starting engine has more power for surer, faster starts in all weather, and simple single-lever control for easier operation.

New "water quench" process for hardening track shoes almost doubles shoe life.



NEW 128-HP ENGINE features improved fuel injection system, flanged center main bearing to take crankshaft thrust, many other advances.

The new D7 Series C is ready now to give you more profitable production than ever before. Call your Caterpillar Dealer today for a demonstration!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Both Cat and Caterpillar are registered trademarks—®

CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS
I would like additional information on the new D7 Series C

Name _____

Company _____

Street _____

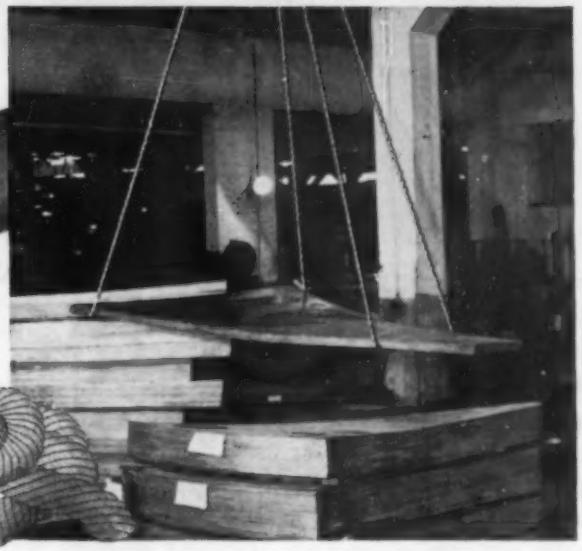
City _____ Zone ___ State _____

THE NEW D7...MORE POWER, SMOOTHER PERFORMANCE

PROVE Tuffy®

GIVES YOU MORE SERVICE PER DOLLAR

FREE Tuffy® SLING



ABUSE IT! MISUSE IT! IT WILL STILL PROVE TOUGHEST SLING OF ALL!

Do Your Worst to the free Tuffy Sling we send you! Loop it, kink it, jerk it, knot it—subject it to the conditions that ruin the most slings for you. You'll find Tuffy takes more rough treatment than any sling you've ever used!

Tuffy's Patented Construction is an exclusive, machine braided-wire fabric that's extra flexible to help resist kinking. If you *can* kink it, your Tuffy Sling is easy to straighten without material damage!

Send For Your Free Tuffy Sling and try it on the toughest tests you can devise. Find out for yourself why Tuffy Slings are the toughest you can buy!

Tuffy® HOIST LINE

Strong As Tuffy Slings! Tuffy Hoist Line is constructed to handle the varied strains of lifting over a long period of time . . . give you extra safety from drum to sling!

Easy To Order because there are no complicated specifications — just length, diameter and "Tuffy Hoist Line." Whether you use overhead, stiff leg or mobile cranes, derricks or clam shells, try Tuffy Hoist Line and see the difference!

Your Tuffy Distributor Stocks to Meet Your Needs

When You Need Rope Fast, your Tuffy distributor is a handy man to know. Because he's happy to stock ahead of your replacement schedule . . . be ready with the rope you want, *when* you want it. Just give him an idea of your requirements and he will order from his nearby mill depot for months-ahead service. Talk to him *soon!*

union Wire Rope **corp.**

Specialists in High Carbon Wire, Wire Rope and Braided Wire Fabric

TEAR OFF AND MAIL COUPON *NOW!*

Union Wire Rope Corporation
2278 Manchester Ave., Kansas City 26, Mo.

At no cost or obligation to me, please rush the material I have checked.

- ☐ FREE 3-Ft. Tuffy Sling!
- ☐ FREE Sling Handbook and Rigger's Manual, Featuring 12 Tuffy Factory-Fitted Types!
- ☐ Name and Address of Tuffy Distributor Nearest Me!

FIRM NAME_____

BY_____ TITLE_____

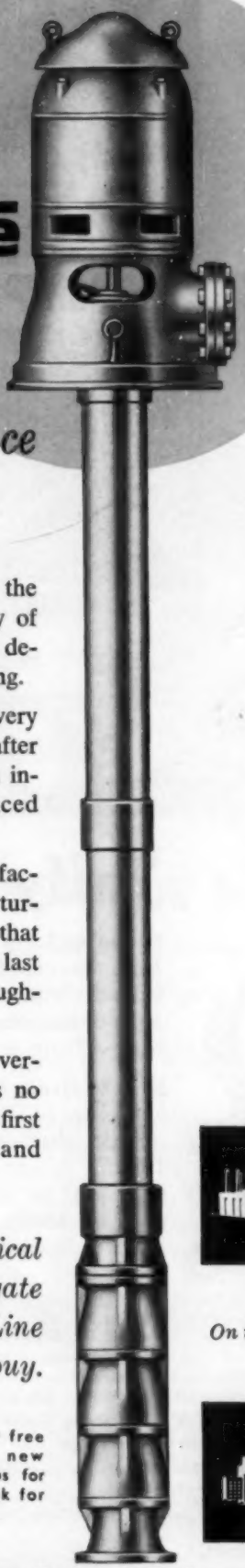
ADDRESS_____

CITY_____ ZONE____ STATE_____

For more data on advertised products, use Readers' Service Cards, last page.

Verti-Line PUMPS

are backed by 47 years of experience



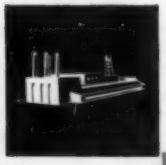
Verti-Line Turbine Pumps are the result of almost half a century of experience in pump research, design, engineering, manufacturing.

Designed and engineered into every Verti-Line Pump are feature after feature that have been proven in-the-field to give better balanced performance and efficiency.

The highest standards of manufacturing quality-control in the turbine pump industry guarantee that Verti-Line Pumps are made to last longer, operating under the toughest conditions.

More than 100,000 satisfied vertical pump users agree there's no pump like Verti-Line for low first cost, economical operation, and negligible maintenance.

Whatever your vertical pump needs — investigate Verti-Line before you buy.



In All Industry

On the Farm

For the City

Send for your free copy of our new booklet, "Pumps for Sale" . . . Ask for Bulletin P-35.

Verti-Line Pumps are the exclusive products of

LAYNE & BOWLER PUMP COMPANY

general offices and main plant

2943 VAIL AVENUE • LOS ANGELES 22, CALIFORNIA

PIPE LINE INDUSTRY

Specialized oil publications of **THE GULF PUBLISHING COMPANY**, 3301 Buffalo Drive, Houston 6, Texas; Box 2608, Houston 1, Texas. Cable Address: **GULFPUBCO.**

PIPE LINE INDUSTRY for the oil and gas pipe line industry.

WORLD OIL and **THE COMPOSITE CATALOG** for the drilling-producing-pipe line industry.

PETROLEUM REFINER and **THE REFINERY CATALOG** for the refining-natural gasoline-petrochemical industry.

•

RAY L. DUDLEY, President, Publisher

A. L. BURNS, Vice President, General Manager

•

EDITORIAL STAFF

Warren L. Baker, Editorial Director; Donald M. Taylor, Editor; Al Reese, Managing Editor; Melvin A. Judah, Cecil W. Smith, Don Kliewer, Wallace Fitzgerald, William G. Dudley, Associate Editors.

District Editors: Robert E. Spann, 250 Park Ave., New York 17, N. Y.; Gilbert M. Wilson, W. W. Wilson Building, Huntington Park, Calif., and Anthony Gibbon, Hunt Building, Tulsa 3, Okla.

Editorial Assistants: Mary Stuart Warren, Joan Frandolig.

Librarian: Eunice Okoneski.

•

CIRCULATION DEPARTMENT

R. M. de Sombre, Manager.

•

ADVERTISING STAFF

Tom W. Nelson, Advertising Manager; D. S. Craig, Advertising Service Manager. *Representatives:* NEW YORK (17): Gene Hart, George Skelton, Nelson Bigelow, 250 Park Ave., Phone El Dorado 5-4012; CLEVELAND (15): Bill Westfall, 1010 Euclid Ave., Phone MAin 1-2550; CHICAGO (4): H. G. Fitzpatrick, Martin Halloran, 332 So. Michigan Ave., Phone Wabash 2-9330; LOS ANGELES: Jay Curts, W. W. Wilson Bldg., Huntington Park, Phone Jefferson 1219; TULSA (3): Bill Atcheson, Jim Isaacks, Hunt Bldg., Phone 3-1844; HOUSTON (6): Charles Wyatt, Clair Bryan, Jr., 3301 Buffalo Drive, Phone LYnchburg 4301; EUROPEAN: Theodor Miocha, Limmerstrasse 31, Hannover, Germany, Phone 4-2935; UNITED KINGDOM: Frank Chambers, 120, Moorgate, London, E.C. 2, Phone Monarch 5661.

•

Single copies 50 cents (except special issues). Double price for single copies more than a year old. Subscription price: domestic and foreign $2 a year; 2 years, $3; 3 years, $4. Subscription restricted to those engaged in the pipe line branch of the oil and gas industry, or the manufacturing and distribution of pipe line equipment.

Advertising rates on application. Copyright, 1955, by The Gulf Publishing Company.

Butyrate pipe is light

Tenite Butyrate pipe weighs only 1/12th as much as cement-lined metal pipe. One man can easily carry three 20-foot lengths of 4" Tenite pipe.

Butyrate pipe is easy to join

Joining Tenite Butyrate pipe in the field is fast and easy. You just solvent weld slip-sleeve couplings to the pipe ends. Your only "tool" is a paint brush.

Butyrate pipe resists corrosion

Buried or exposed to the weather, Tenite Butyrate pipe eases corrosion problems because it resists salt water, sour crudes and electrolytic soils.

Could these advantages of Tenite Butyrate help you?

REMEMBER WHEN corrosion and paraffin clogging were two inescapable problems for pipe lines? They're not today, though. Oil men have found that pipe made of Tenite Butyrate resists all the corrosion encountered in oil fields. And in high-paraffin crude lines where metal pipe would have to be cleaned more than once a week, Tenite Butyrate pipe remains clear with few, if any, shutdowns necessary.

Tenite Butyrate pipe offers many advantages over metal pipe and has proved itself in all types of fields for several years. Today, the question no longer is, *"Will Butyrate pipe do the job?"* but rather, *"When will you give Butyrate a chance to do the job?"*

For further information and technical help in adapting long-lasting Tenite Butyrate pipe to your operations, write: EASTMAN CHEMICAL PRODUCTS, INC., Kingsport, Tennessee, subsidiary of Eastman Kodak Company.

TENITE
BUTYRATE
an Eastman plastic

EASTMAN CHEMICAL PRODUCTS, INC.
KINGSPORT, TENNESSEE

Please send me information on TENITE BUTYRATE PIPE and a list of companies manufacturing Tenite pipe and fittings.

NAME.....

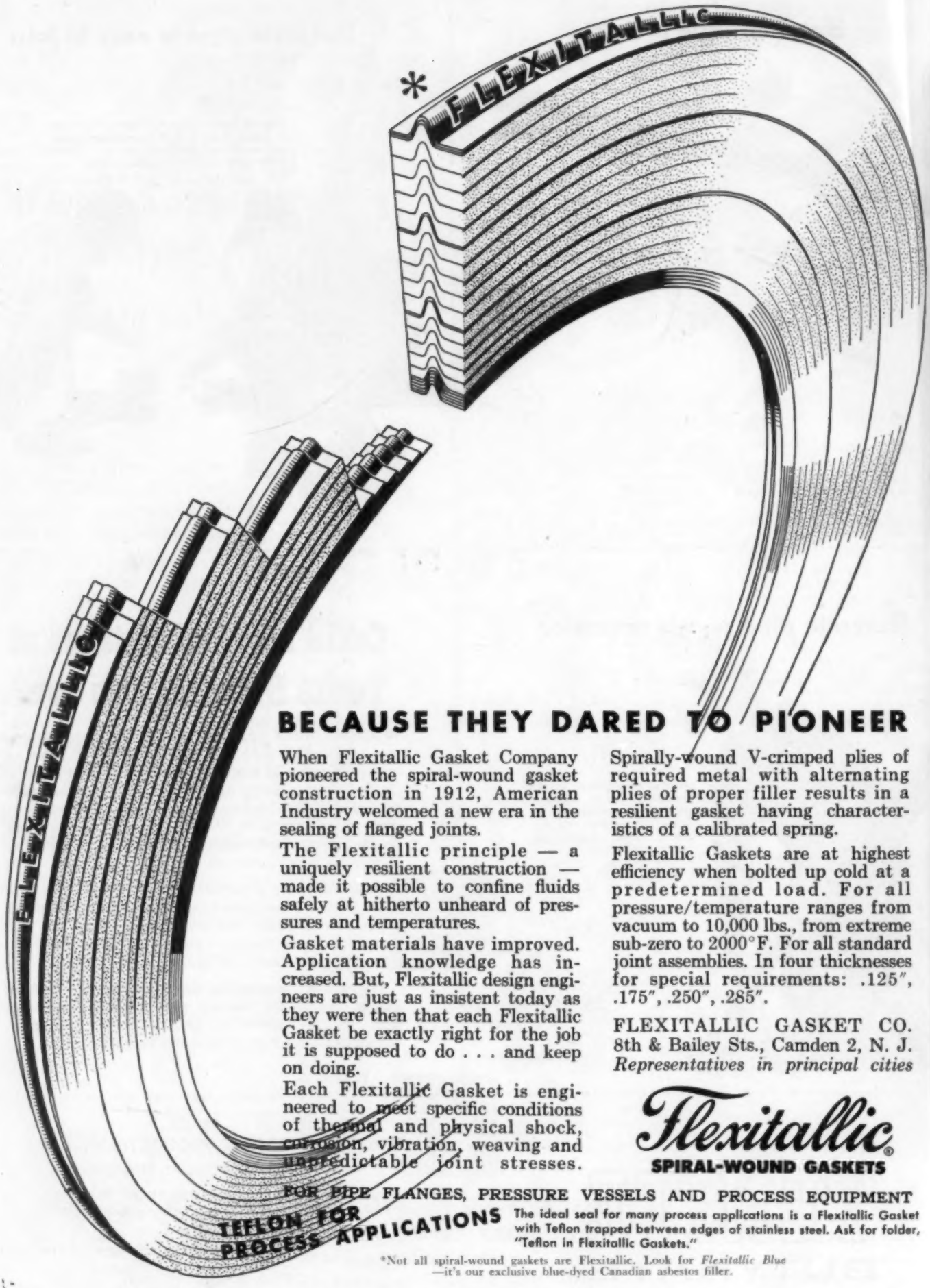
POSITION.....

COMPANY.....

STREET.....

CITY..... STATE.....

PL 1-355



BECAUSE THEY DARED TO PIONEER

When Flexitallic Gasket Company pioneered the spiral-wound gasket construction in 1912, American Industry welcomed a new era in the sealing of flanged joints.

The Flexitallic principle — a uniquely resilient construction — made it possible to confine fluids safely at hitherto unheard of pressures and temperatures.

Gasket materials have improved. Application knowledge has increased. But, Flexitallic design engineers are just as insistent today as they were then that each Flexitallic Gasket be exactly right for the job it is supposed to do . . . and keep on doing.

Each Flexitallic Gasket is engineered to meet specific conditions of thermal and physical shock, corrosion, vibration, weaving and unpredictable joint stresses.

Spirally-wound V-crimped plies of required metal with alternating plies of proper filler results in a resilient gasket having characteristics of a calibrated spring.

Flexitallic Gaskets are at highest efficiency when bolted up cold at a predetermined load. For all pressure/temperature ranges from vacuum to 10,000 lbs., from extreme sub-zero to 2000°F. For all standard joint assemblies. In four thicknesses for special requirements: .125", .175", .250", .285".

FLEXITALLIC GASKET CO.
8th & Bailey Sts., Camden 2, N. J.
Representatives in principal cities

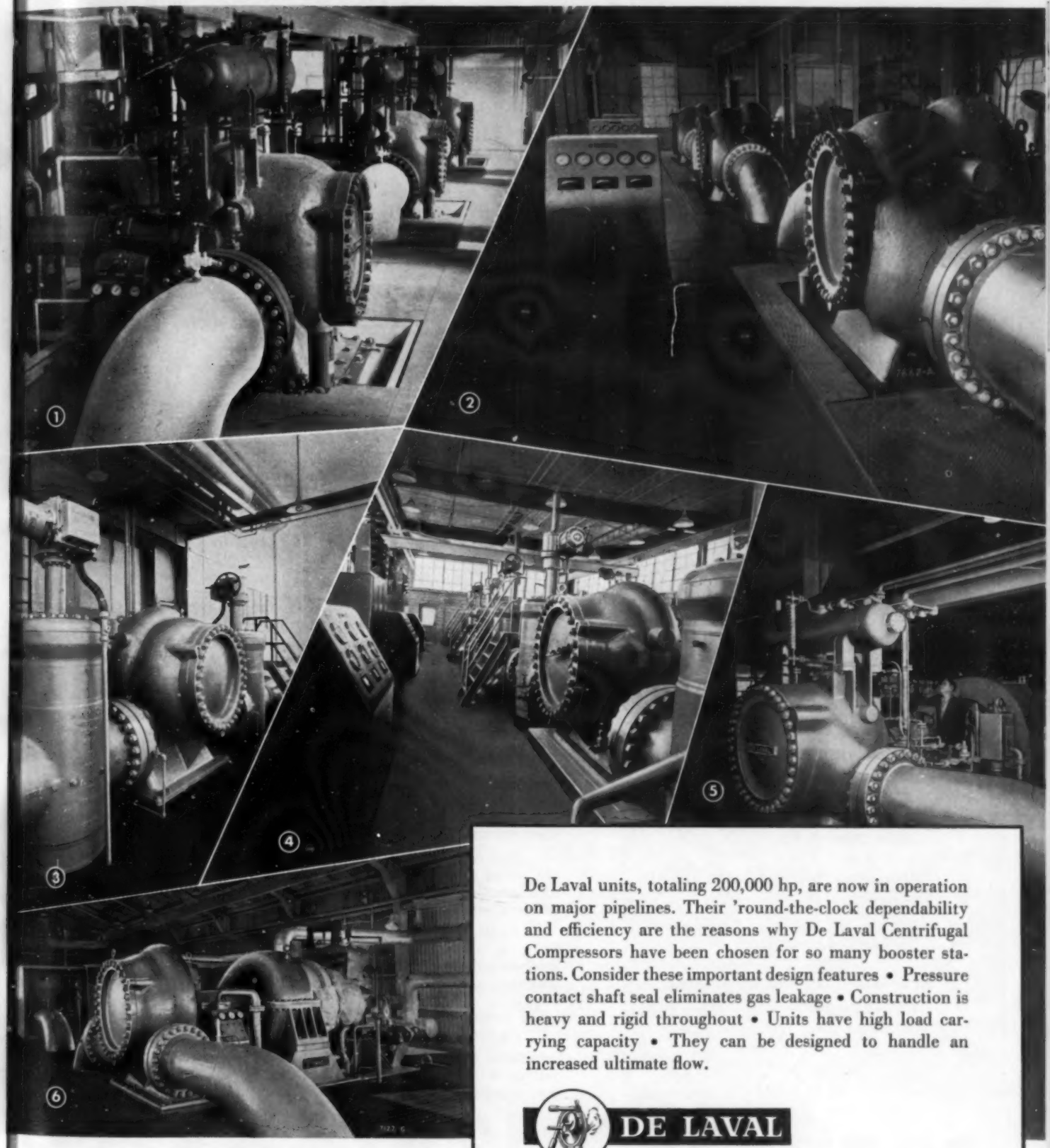
Flexitallic®
SPIRAL-WOUND GASKETS

FOR PIPE FLANGES, PRESSURE VESSELS AND PROCESS EQUIPMENT

TEFLON FOR PROCESS APPLICATIONS The ideal seal for many process applications is a Flexitallic Gasket with Teflon trapped between edges of stainless steel. Ask for folder, "Teflon in Flexitallic Gaskets."

*Not all spiral-wound gaskets are Flexitallic. Look for *Flexitallic Blue* —it's our exclusive blue-dyed Canadian asbestos filler.

These pipelines depend on DE LAVAL *Centrifugal Compressors*



Located in booster stations of:

1. *Northern Natural Gas Company*
2. *El Paso Natural Gas Company*
3. *Southern Counties and Southern California Gas Companies*
4. *Texas Eastern Transmission Corporation*
5. *United Gas Pipe Line Company*
6. *Transcontinental Gas Pipe Line Corporation*

De Laval units, totaling 200,000 hp, are now in operation on major pipelines. Their 'round-the-clock dependability and efficiency are the reasons why De Laval Centrifugal Compressors have been chosen for so many booster stations. Consider these important design features • Pressure contact shaft seal eliminates gas leakage • Construction is heavy and rigid throughout • Units have high load carrying capacity • They can be designed to handle an increased ultimate flow.

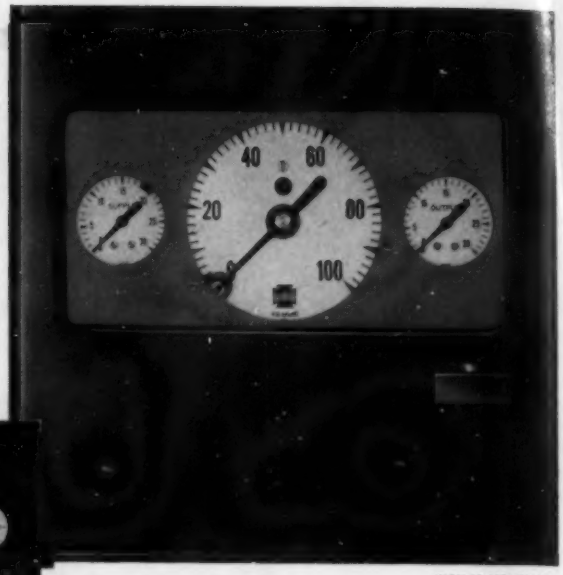
DE LAVAL

Centrifugal Compressors

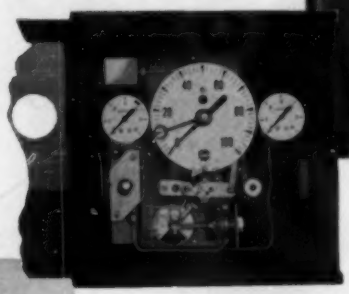
DE LAVAL STEAM TURBINE COMPANY

884 Nottingham Way, Trenton 2, New Jersey

Check all these features...



PATENTS APPLIED FOR



Only the USG PRESSURE PILOT *gives them all to you!*

- ✓ **Embodies precision process gauge, precalibrated and interchangeable. (3½" dial).**
- ✓ **Calibrated set point indicator.**
- ✓ **Screwdriver setting for band adjustment and for selecting desired control action.**
- ✓ **Self-contained Bleed Relay (1¼ CFM capacity) easily adjusted in the field.**
- ✓ **Feedback proportional control or gap action (1-100%).**
- ✓ **Pointer synchronizing adjustment (manual reset).**
- ✓ **Unitized construction.**
- ✓ **Panel or field mounting. (Size—8 9/16" square x 4" deep, including knob.)**

Integral process pressure gauge . . . flexible control . . . rugged "unitized" construction . . . manual reset . . . easy selection of control action . . . self-contained bleed relay . . . interchangeable measuring elements . . . simple adjustments . . . modern case styling . . . all the features you need in a pressure pilot—built into a *standard* USG Pressure Pilot.

The USG Pressure Pilot is a major advance in indicating pressure pilots. Incorporating a precision process gauge, it eliminates the need for a separate indicator and provides a direct reading of the set point on a calibrated dial. Exclusive "unitized" construction permits the removal of components and sub-assemblies for maintenance without disturbing the remaining units. The self-contained bleed relay may also be dismantled and cleaned without disturbing its settings.

Simple knob or screwdriver adjustments provide easy set point and control action selection. USG Pressure Pilot also provides 1-100% proportional band or differential gap control with direct or reverse action as required.

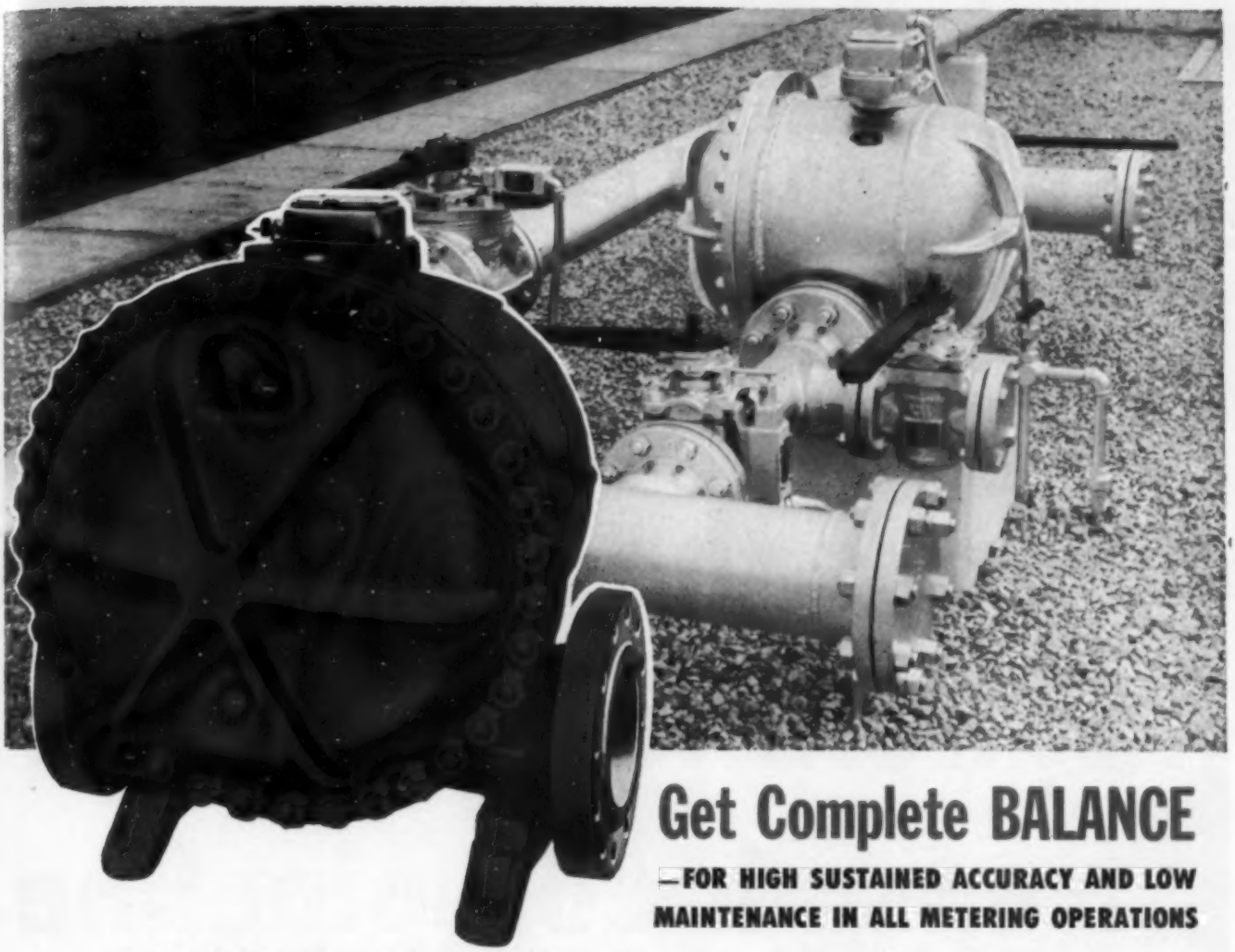
Available in ranges from 15 psi to 10,000 psi, the USG Pilot is adaptable to pressure control applications in the process industries. Boiler steam pressure, vacuum relief, pump discharges, fluid pressure and a host of other applications requiring proportional or gap control can be performed by the USG Pressure Pilot—accurately, dependably, economically.

USG is making new advanced design Pressure Pilots available to valve manufacturers. When in the market for valves with pilots be sure to specify that the valves are equipped with USG Pressure Pilots.

UNITED STATES GAUGE

Gauge Headquarters FOR OVER 50 YEARS

United States Gauge, Division of American Machine and Metals, Inc., Sellersville, Penna.



Get Complete BALANCE

—FOR HIGH SUSTAINED ACCURACY AND LOW MAINTENANCE IN ALL METERING OPERATIONS

Only with Brodie exclusive balanced performance can you get the most from petroleum product measurement.

EXCLUSIVE STATIC AND DYNAMIC BALANCE

Only Brodie BiRotors are *designed* for static and dynamic balance to minimize vibration and bearing-load at all operating speeds – with no reciprocating parts or vanes.

BALANCED SIMPLICITY, DESIGN COMPACTNESS

Just two moving parts with simple rotary motion in measuring chamber allow compact design for clean installations, easy flexibility of piping arrangements.

BALANCED UNIT-BUILT ASSEMBLIES

Just 4 unit-built assemblies, accessible or removable for cleaning without disturbing piping connections. Double-case construction means that no piping strains can distort measuring element.

BALANCED FLOW CHARACTERISTICS

Simple direct flow-lines with smooth, continuous, non-pulsating delivery, assure high thru-put with top efficiency of pressure system.

Not only for pipeline service – but wherever petroleum products are handled – Brodie BiRotors consistently measure with high sustained accuracy and extremely low maintenance or downtime. No single factor has been over-emphasized, minimized or sacrificed at the expense of any other. And there's a BiRotor model for every petroleum metering need. Investigate fully today.

BRODIE ALL-STEEL BiRotor TRUE-ROTARY METERS

RALPH N. BRODIE COMPANY • San Leandro, California, U.S.A.

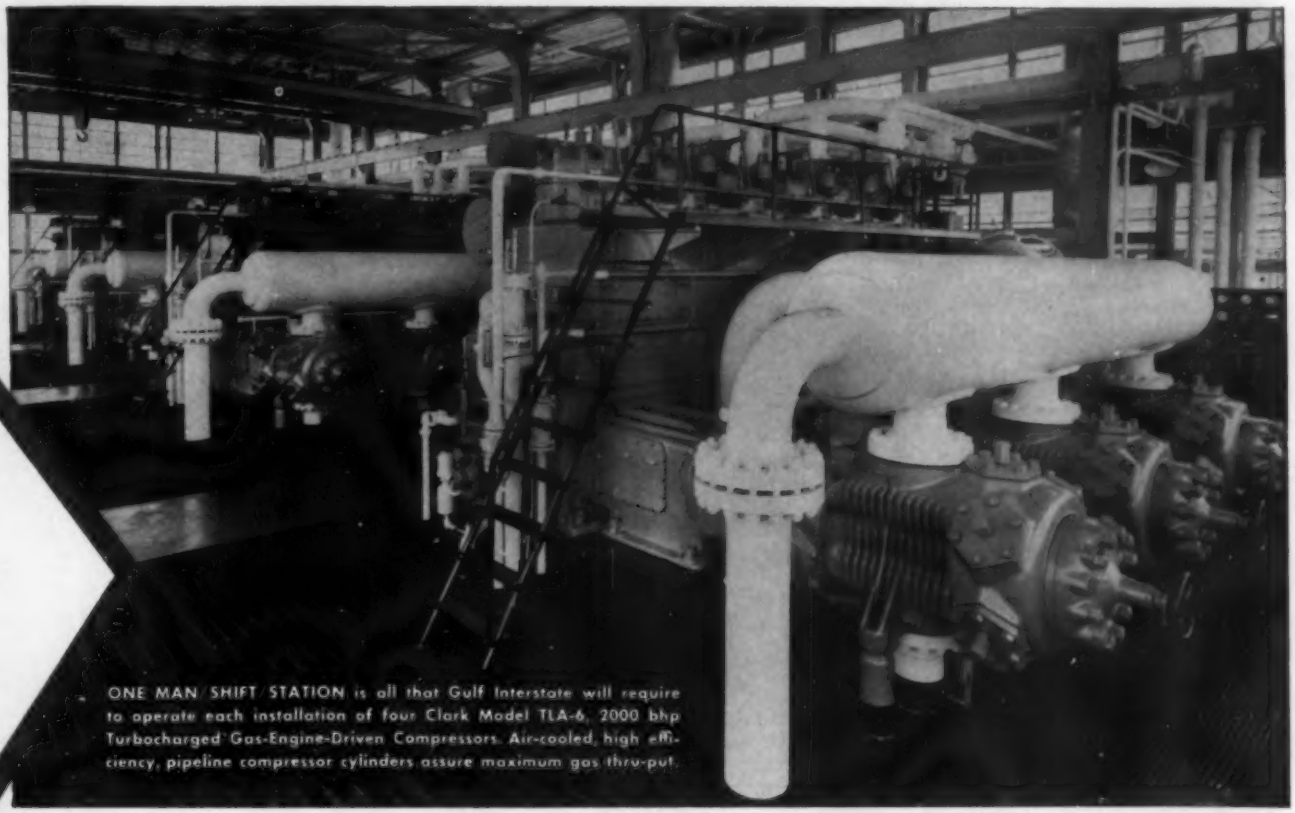
MT. VERNON, N. Y.	FOREST PARK, ILL.	DALLAS 2, TEXAS	SEATTLE 9, WASH.	LOS ANGELES 22, CALIF.
550 So. Columbus Ave.	1227 Circle Ave.	167 Parkhouse St.	221 9th Ave. N.	5401 E. Sheila Street

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

Here's the pattern for gas transmission pipeline compressor stations of the future!

NEW GULF INTERSTATE SYSTEM

Selects the Clark Turbocharged Model TLA-6 for its Automatic, Push-Button Operated Stations



ONE MAN / SHIFT / STATION is all that Gulf Interstate will require to operate each installation of four Clark Model TLA-6, 2000 bhp Turbocharged Gas-Engine-Driven Compressors. Air-cooled, high efficiency, pipeline compressor cylinders assure maximum gas thru-put.

It's already an accepted fact that the Gulf Interstate Gas Company has changed the pattern for natural gas transmission with its one man, push-button controlled, automatic compressor stations.

With such advanced thinking, it's only natural that Gulf Interstate will be the first to use the NEW Clark Model TLA, 2000 bhp, Turbocharged Compressors in conjunction with their newly developed system of controls.

Gulf Interstate's control devices for automatic operation of these Clark Compressors did not appreciably increase the installed cost.

If you're interested in a compressor station that can be operated with the highest possible efficiency — *automatically* — while still maintaining station-loading flexibility, be sure you investigate Clark Models TRA and TLA Compressors. There are 8 sizes in a range of 825-3300 bhp. Ask your nearest Clark representative for Bulletins 130 and 134.

CLARK BROS. CO. • OLEAN, N. Y.
ONE OF THE DRESSER INDUSTRIES
Sales Offices in Principal Cities Throughout the World

A dozen ways you'll be ahead with Clark TLA's

- 7000 btu/bhp/h fuel consumption.
- 40% less cooling required.
- 25-30% lower installation cost.
- Drastic reduction in number of moving parts.
- 90% engine mechanical efficiency.
- Detonation-free operation under all climatic conditions.
- Generous temporary overload capacity.
- Specifically designed for turbocharging.
- Low cycle temperatures for maximum cylinder and ring life.
- Only one turbocharger per unit.
- Unapproached for accessibility.
- 2-cycle simplicity, dependability.

CLARK compressors

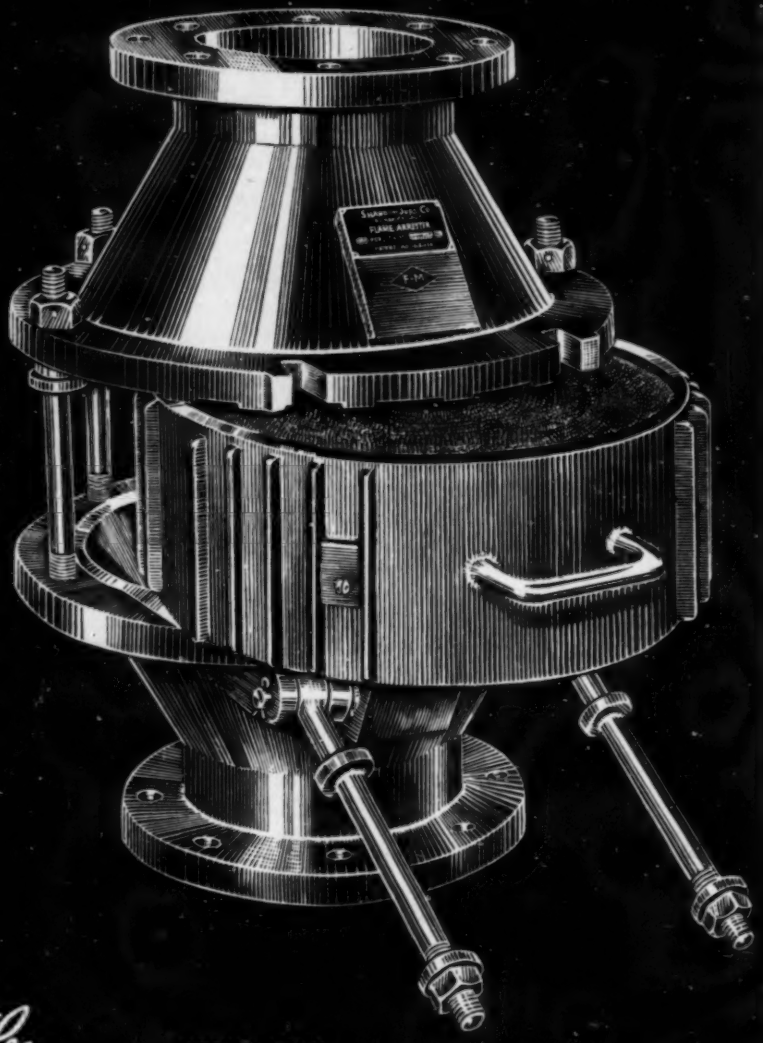
Clark sets the pace in compressor progress

For more data on advertised products, use Readers' Service Cards, last page.

S&J FLAMEX *Does just that!*

THE Shand & Jurs "Flamex" is the flame arrester that positively X's out the chance of flame endangering tank contents. The "Flamex" is available in many different combinations of metals. It can meet any special requirements in the Oil, Chemical and Petro-Chemical Industries. Used in the same manner and places as regular flame arresters, the S&J "Flamex" will provide longer useful life, lower maintenance cost, and in the long run, GREATER SAFETY.

The "Flamex," identified as Fig. ST-4300, incorporates a spirally wound tube bank of alternate flat and corrugated metal sheets around a solid core of like material. The passages thus formed run parallel to normal gas flow. For maximum safety, end section faces are precision ground, assuring positive, tight seats. Quick removal of the bank for inspection or cleaning is accomplished by unscrewing one or more clamp bolts which swing down. The other bolts are used to jack the ends apart for easier bank removal.



Shand and Jurs Co.
BERKELEY 10, CALIFORNIA

NEW YORK
342 Madison Ave.

CHICAGO
10409 S. Western Ave.

HOUSTON
M & M Bldg.

TULSA
Thompson Bldg.

LOS ANGELES
714 W. Olympic Blvd.

REPRESENTATIVES:
SEATTLE: Nebar Supply Company, 3000 Western Avenue
MONTREAL: Lytle Engineering Specialties, Ltd., 360 Notre Dame St., W.
TORONTO: Lytle Engineering Specialties, Ltd., 85 Richmond St., W.
VANCOUVER: P. D. McLaren & Son, Ltd., 3277 Main Street
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London, S.W. 1
Whessoe, Ltd., Works: Darlington, County Durham

Here's how they KO'd SULPHUR, CHEMICALS SALT, AIR and HEAT on this Refinery Pipe line!

1. It takes no special equipment to apply Pitt Chem. Here, applicators brush on 101 about 12 mils thick.

2. Pitt Chem applies easily, even on awkward underside. Crew learned to apply it in a few minutes.

3. Pitt Chem 101 was economical to purchase and apply. It will protect this line against corrosion for years.

MAINTENANCE engineers at this Southwestern refinery realized that no ordinary coatings could protect these pipelines from the metal-eating conditions they faced. Today, the lines are safely protected with an impervious film of *Pitt Chem*® Tar Base Coating, the material that *naturally* resists practically all major types of industrial corrosion.

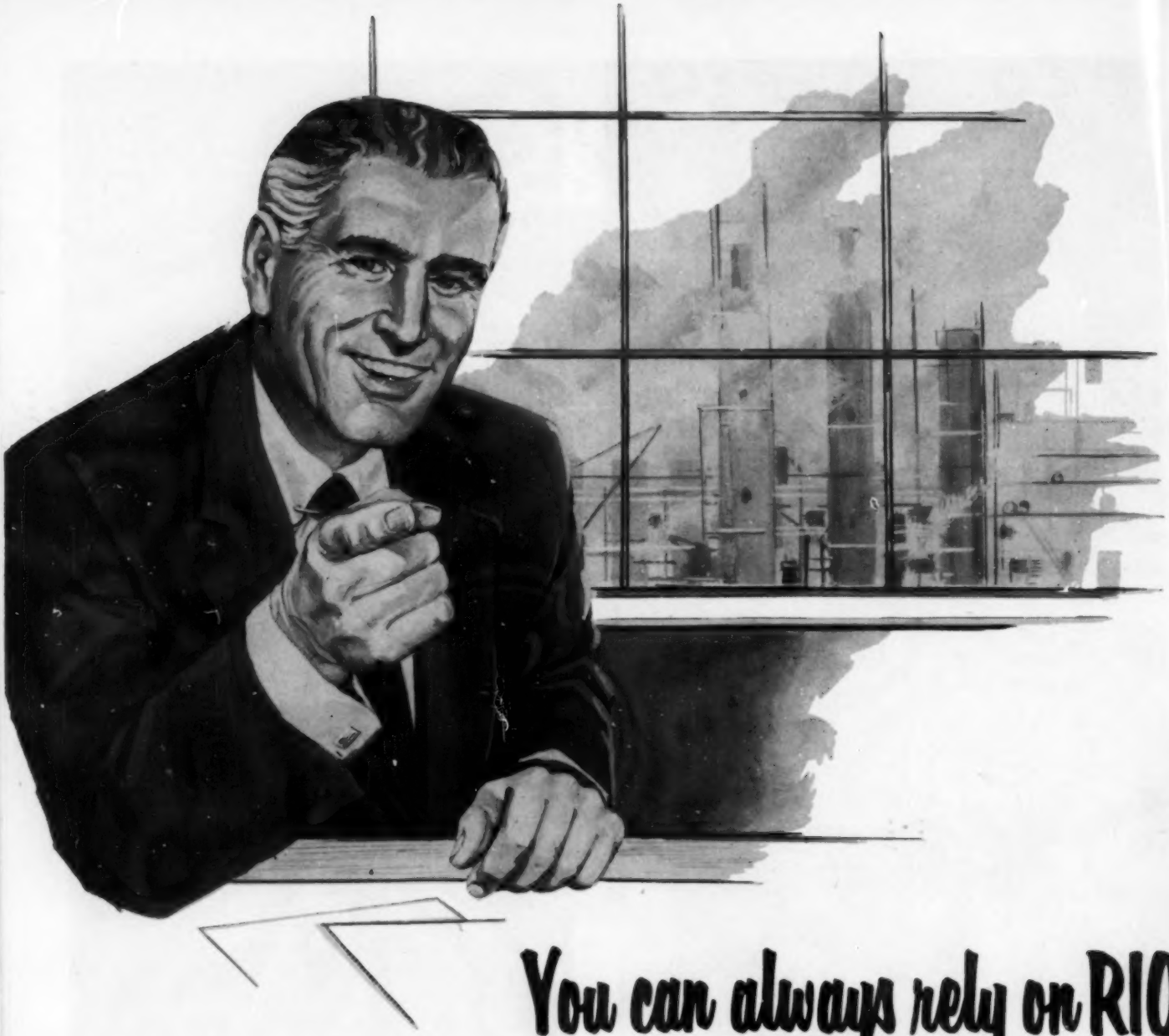
Pitt Chem Tar Base Coatings are tailor-made for protecting oil producing and refining equipment against corrosion. They are highly resistant to petroleum products as well as mineral acids, alkalis and moisture. They are economical to buy and easy to apply.

No other material does such a complete job of protection at so little cost. That's a big statement, but our corrosion engineers have the facts to prove it.

If you have a corrosion problem—and never mind how tough it seems—contact us today. You may be surprised how quickly and economically it can be solved.

W&D 5485

COAL CHEMICALS • AGRICULTURAL CHEMICALS • FINE CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON



You can always rely on RIO

...FOR COMPLETE CATHODIC PROTECTION

We Have For Years! They have cut our Cathodic Protection costs and will do the same for you. RIO is a pioneer in the field of cathodic protection contracting. They bring years of successful experience to the solution of corrosion problems.

There are successful Rio-Engineered and Rio-Installed systems throughout the country, and we have found their service and installations efficient, economical and long-lasting.

If you have corrosion problems, call Rio Engineering. Ask about the 5 ways their installation service can cut your cathodic protection costs. Their record for excellent performance proves they are the best.

FOR LONG-LIFE, TROUBLE-FREE INSTALLATIONS — RELY ON RIO

RIO *Engineering Company* HOUSTON, TEXAS

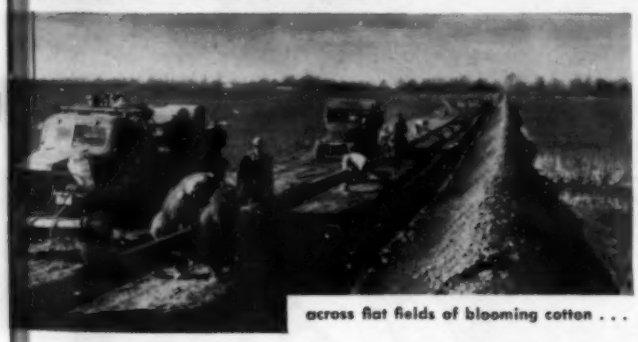
Your Shield Against Corrosion • P. O. Box 6035 • KE-9792

For more data on advertised products, use Readers' Service Cards, last page.

NATIONAL SEAMLESS USED FOR ANOTHER TOUGH JOB...

475-mile Pipeline Opens New Market Area
FOR OKLAHOMA REFINERIES

Through wooded hills . . .



across flat fields of blooming cotton . . .

and through the sandy bed of the dammed-up Arkansas River

• Approximately 34,000 tons of 12¾" O.D. National Seamless Steel Pipe were used in the construction of the 475-mile oil products pipeline for Oklahoma Mississippi River Products Line, Inc. Originating at Duncan, Oklahoma, the line runs eastward, across Oklahoma and Arkansas, to its destination at West Memphis, Arkansas. USS National Seamless Pipe was used in that section between Allen, Oklahoma and West Memphis—shown in red on the map.

The pipeline opens a large, new market area to the east for Oklahoma refineries, terminating on the west bank of the Mississippi where low cost water transportation up the Mississippi and Ohio rivers is available.

Construction of the line was started in November of 1953 and was completed in June 1954. It has an initial capacity of about 40,000 bbl. per day, operating with pump stations at Duncan, Wynnewood, and Allen, Oklahoma, and Conway, Arkansas.

As is often the case when an unusually tough job comes along—and cross-country pipelines are among the toughest—the engineers turned to National Seamless Pipe for the necessary combination of high strength, extreme flexibility, and complete uniformity that only *seamless* can give. They needed pipe that would resist great pressures, would absorb distorting and bending stresses; pipe that possessed superior welding characteristics; pipe that could be depended upon to give uninterrupted and satisfactory service for years to come. In National Seamless, they knew from long experience that they had all of these qualities, and more—the reputation and know-how of National Tube, world's largest producer of tubular steel products.

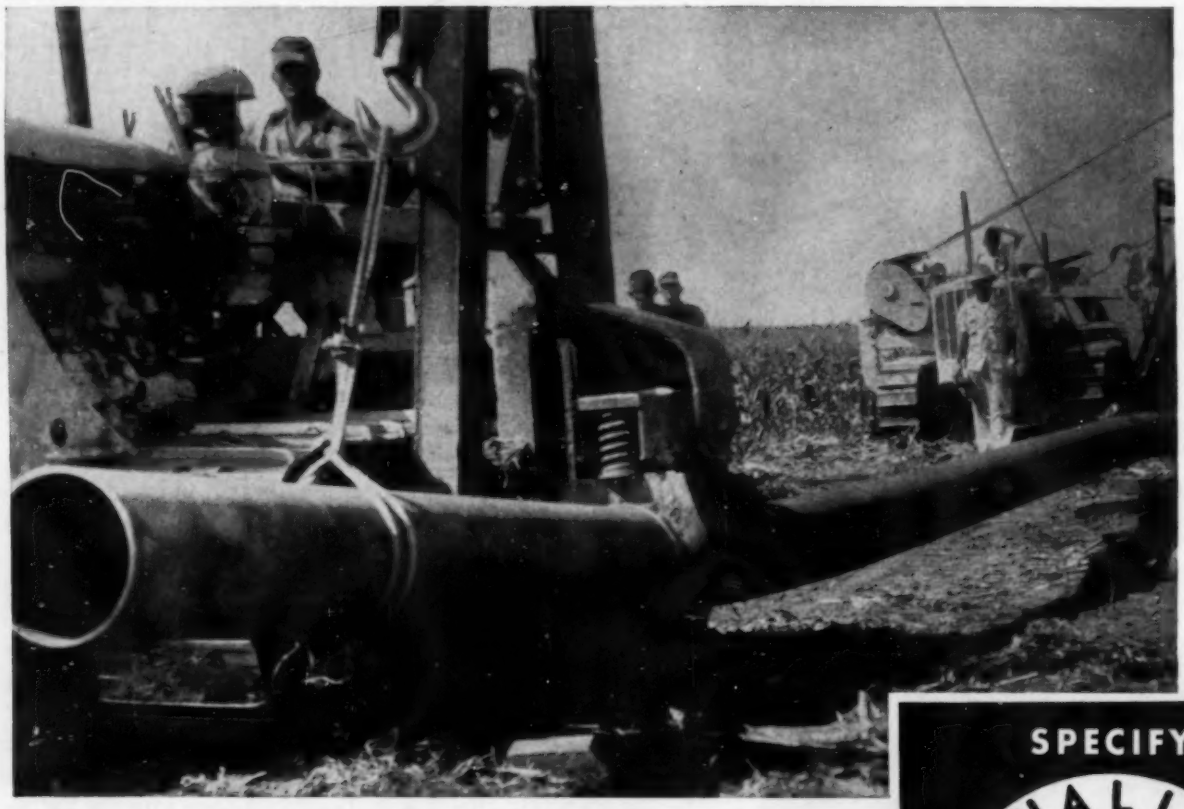
NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS

NATIONAL SEAMLESS PIPE AND TUBES

WALLS WITHOUT WELDS

YOUNGSTOWN LINE PIPE ...UNIFORM QUALITY, ACCURATE BENDING



●The secret of bendability is uniform, high quality steel. Youngstown Electric Weld Line Pipe is uniform in quality for accurate bending. It has the right physical and chemical properties to bend readily to fit the contour dictated by the terrain. It bends quickly, evenly, smoothly—and holds its roundness. For these reasons, men on the job prefer to work with Youngstown.

SPECIFY QUALITY YOUNGSTOWN SERVICE

ELECTRIC WELD **LINE PIPE**

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices: Youngstown 1, Ohio • Export Office: 500 Fifth Avenue, New York 36, N. Y.

At last!

A TRUE VINYL MASTIC!

Complete protection in a single coat—10 mils thick!

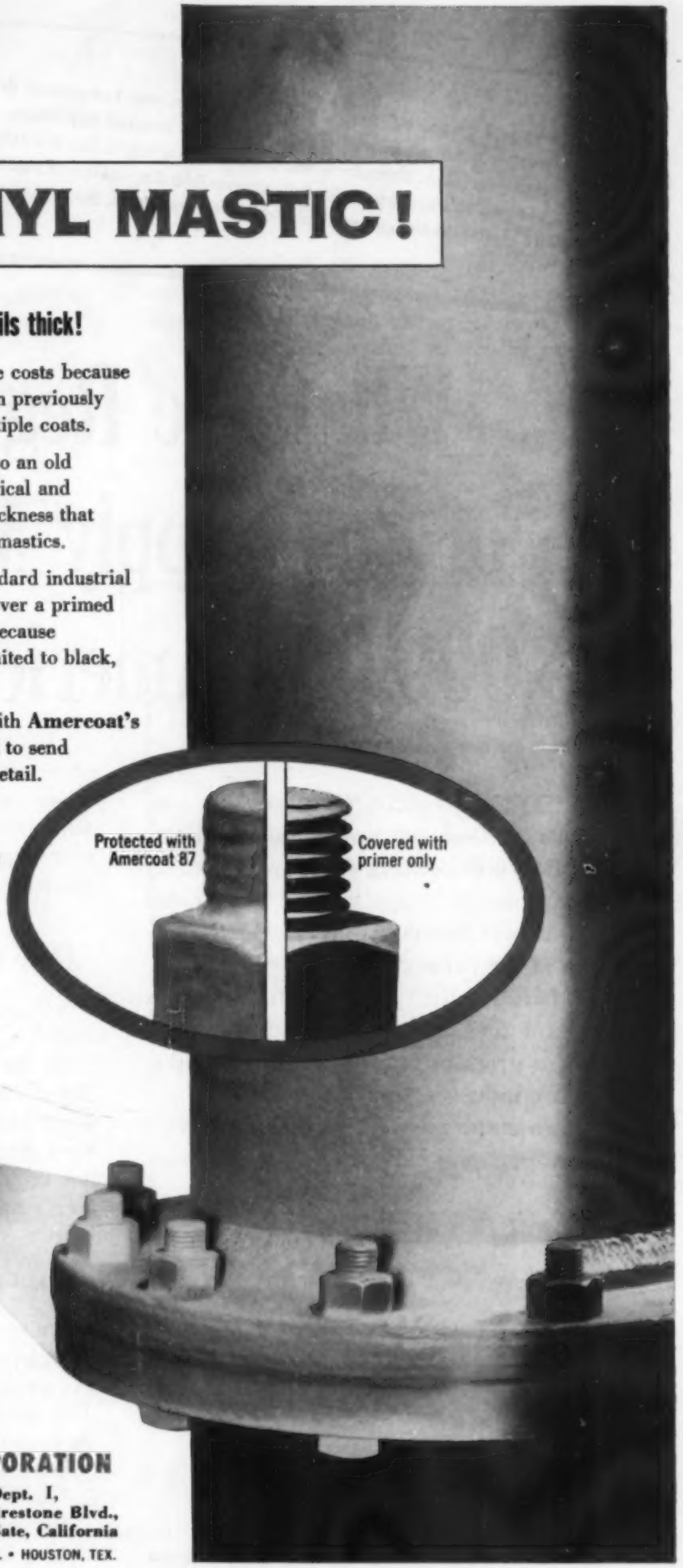
Amercoat No. 87 will cut your maintenance costs because one coat gives you the thickness and protection previously available only through the application of multiple coats.

Amercoat No. 87 is the brand new solution to an old problem, for it combines the time-tested chemical and weather resistance of a vinyl with the extra thickness that was heretofore available only in conventional mastics.

Amercoat No. 87 is easily applied with standard industrial spray equipment. Only one cross-spray coat, over a primed surface, is required for complete protection. Because **Amercoat No. 87** is a true vinyl, it is not limited to black, but is available in a variety of colors.

You can save up to 50% of your labor costs with **Amercoat's new vinyl mastic No. 87.** We will be pleased to send you a bulletin describing this new coating in detail.

Notice that the sharp bolt threads, welds and sharp corners are completely protected with one coat of Amercoat No. 87—10 mils thick!



Amercoat CORPORATION

Dept. I,
4809 Firestone Blvd.,
South Gate, California

EVANSTON, ILL. • KENILWORTH, N.J. • JACKSONVILLE, FLA. • HOUSTON, TEX.

For more data on advertised products, use Readers' Service Cards, last page.

Natural gas producers, small and large, are convinced that if the American people understand the issues regarding federal regulation they will reach the right decision. Therefore, we are endeavoring to lay the subject before the people and to encourage the fullest possible discussion of the issues. To do so, this advertisement has been placed in newspapers throughout the country.

What the Regulation of Gas Supply Means to 25,000,000 American Families

THE FIVE THOUSAND producers of natural gas—large and small—believe that the free competitive system which has increased your gas supplies and kept rates low is the best for consumers, for the industry, and the economy.

They believe the proposal to abandon competition and clamp bureaucratic controls on gas production will hurt consumers, damage the industry, and *benefit no one*.

Here are some answers to questions you as a consumer may have on this vital issue.

What Is This Regulation?

Sixteen years after a 1938 law was passed, a new interpretation of some of its words now forces the Federal Power Commission to do what it has eleven times refused to do—try to fix the price that an interstate pipeline pays the 5000 competing producers who find the gas and get it from the ground.

Will This Regulation Reduce Our Gas Bills?

Hardly. Only about 10% of the average gas bill goes to the producer who finds the gas and sells it. The other 90% pays for constructing, maintaining and operating the long-distance pipelines and local distribution systems—already regulated.

How Will Regulation Affect Supply?

It will reduce the supply. Most natural gas is produced by "wildcatters" and other independents. They are used to keen competition and big risks. But put them under Federal controls—with permits, endless forms, licenses, hearings and suits—and the work of exploration is sure to suffer. Three new pipeline projects to bring gas to more consumers have been suspended since regulation took effect.

Hasn't Gas Always Been Regulated?

Gas *distribution*, yes. It makes sense to have only one pipeline bring gas to a community—and one gas company distribute it in the community. Both do a good, efficient job for you, and as monopolies they are naturally regulated.

But there's no monopoly in *finding* gas. Far from it. Gas *production* is risky and keenly competitive. There are five thousand large and small producers looking for gas—and finding it in only one out of

every nine exploratory wells they drill. They compete vigorously to sell their gas. A single pipeline may buy from 200 or more producers.

Is Gas Different from Coal or Oil —or Grain?

It isn't. And if there's price-fixing for natural gas at the well so can there be next for coal at the mine or oil at the well—or lumber in the forest, or grain on the farm.

How Did The Consumer Fare Before This Regulation?

Here's the record. In the past 16 years natural gas production has increased 200% and the price the consumer paid for gas has risen only 1/11th as much as the general cost of living.

Do Only A Few Big Companies Produce Gas?

No. The largest 37 companies produce less than half the nation's gas. No single company produces more than 5%. The small producers do more exploratory drilling than do all the big companies combined. And none of the producers has any monopoly, any exclusive franchise, or any protection.

What Is The Natural Gas and Oil Resources Committee?

It is made up of companies and individuals concerned with natural gas. It includes a great many large and small gas and oil producers. All believe there is no more reason for OPA-like price-fixing on gas than on steel, coal, autos, meat, or shoes, which could be next. All believe that free competition is better for all of us than a price-controlled economy, which has historically led to stagnation, scarcity and rationing.

What Can I Do?

You can reason out the issues, reach your own conclusions, and make those conclusions known to your friends and neighbors.

Under free competition without federal regulation—

- Natural gas became plentiful—output rose two hundred per cent in the past sixteen years.
- Natural gas stayed reasonable—and gas prices to the consumer rose only one-eleventh as much as living costs in the past sixteen years.
- Natural gas has helped create thousands of jobs in industry and now supplies one-fourth of the nation's energy resources.

NOW.....cumbersome federal controls threaten all this progress.

FOR MORE FACTS WRITE FOR THIS BOOKLET NOW!

You have the right to know the facts about this new government regulation—a peacetime control of free, competitive producers. Send today for the booklet, "Natural Gas—A Key Resource in Jeopardy."

NATURAL GAS AND OIL RESOURCES COMMITTEE

Room 5401, 350 Fifth Avenue, New York 1, N. Y.

In this 470-mile, 82,000-barrel per day line

ROSS EXCHANGERS COOL LUBE OIL IN ALL 9 NORDBERG ENGINES

On duty on a major 1000-mile pipe line, this Nordberg spark ignition gas Duafuel engine is one of nine that power the pumping of 82,000 barrels of refined products a day over a 470-mile span.

Rated 1600 hp at 460 rpm, each of these 4-cycle, variable compression Nordberg engines has been outfitted with a Ross Type CP Exchanger. Safe, dependable lube oil temperatures are thus assured.

Ruggedness, repeatedly proved, has for years made Ross Exchangers the choice for numerous types and makes of equipment: Compressors, turbines, centrifugal pumps, speed increasers, truck engines, torque converters, hydraulic machinery. Pre-engineering and standardization enable meeting a broad range of requirements . . . *promptly!*

More information is quickly available in Bulletin 2.1K1. Write.

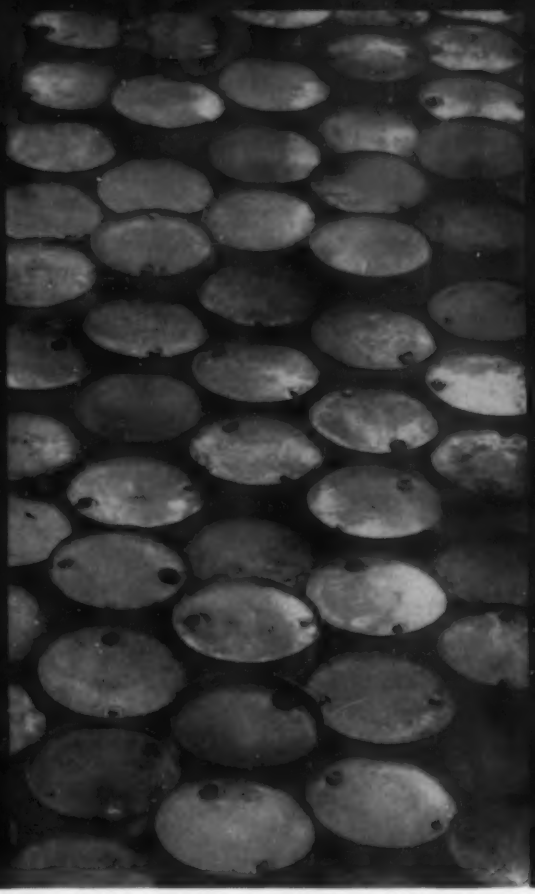
KEWANEE-ROSS PRODUCTS

KEWANEE-ROSS CORPORATION
DIVISION OF AMERICAN RADIATOR & STANDARD SANITARY CORPORATION
1450 WEST AVENUE • BUFFALO 13, N. Y.
In Canada: Kewanee-Ross of Canada Limited, Toronto 5, Ont.

ROSS EXCHANGERS

Serving home and industry: AMERICAN-STANDARD • AMERICAN BLOWER • CHURCH SEATS & WALL TILE • DETROIT CONTROLS • KEWANEE BOILERS • ROSS EXCHANGERS

Only
4 pounds
of
SANTOLENE C
per
thousand
barrels



STOPS RUST in pipe lines!

CHECK LIST OF SANTOLENE C's EXTRA ADVANTAGES:

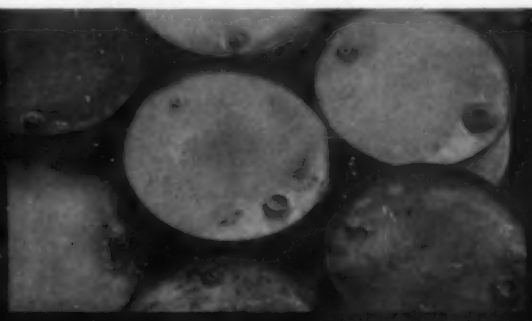
- ☐ Completely product-soluble
- ☐ A one-shot corrosion inhibitor
- ☐ Entirely organic . . . contains no electrolyte
- ☐ Waste-free and nontoxic
- ☐ Offers no waste disposal problem
- ☐ Controls corrosion under both static and dynamic conditions

Actual tests in field installations prove that only 0.0015% by weight of Santolene C in light petroleum product pipe lines will inhibit corrosion. Yet Santolene C has no significant effect on product quality because it burns completely with the fuel.

For full information on Santolene C, write Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Box 478-P-2, St. Louis 1, Missouri.

MONSANTO
CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND



Santolene Reg. U.S. Pat. Off.

IN A FREE ECONOMY

You Can Lead a Horse to Water But . . . . . .

WHEN the United States Supreme Court throttled the gas producer with price fixing, several interstate pipeline projects were postponed. The builders still want to construct them but they no longer have assurance of an adequate gas supply. Rather than sell under prices fixed by the Federal Power Commission, many producers declined to make contracts.

In other instances, some producers discontinued deliveries under existing contracts which provided for such action in case of Federal price fixing. Some who fought for the price-fixing decision promptly besought the Federal Power Commission to compel producers to continue deliveries. This seems like another issue for the courts.

The man with gas reserves not under contract cannot be compelled to enter into a contract, which means the construction of interstate transmission systems will move at a slow pace until the Natural Gas Act is clarified.

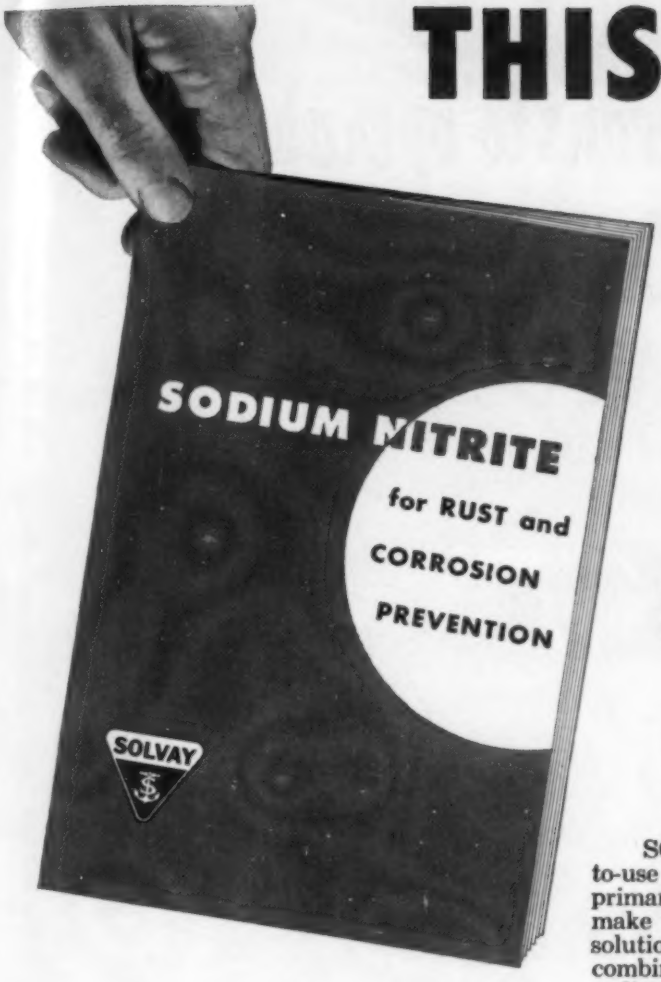
What will these gas producers do with their gas? Those who anticipate that the producer will, in time and of necessity, have to submit to price fixing should have a look around. Two Southwestern plants, one for making chemicals, the other for aluminum ore reduction, use more gas per day than all of the homes in Detroit, Milwaukee and Kansas City, combined.

Natural gas is sometimes called the "world's outstanding raw chemical." It is used in making nylon salts; can be converted into acetylene, and its hydrogen content can be combined with nitrogen (from the air) to make ammonia. As a low-cost, efficient fuel for our homes, our industries and our people, natural gas has no superior.

Rather than sell it at a government-fixed price, many producers are determined to use or sell it within the state where it is produced. The finished chemicals made from and with it can move across state lines without price control. Why not natural gas, whose benefits are anxiously sought by so many millions of Americans?

HOUSTON CONTRACTING COMPANY
General Contractors

Laurence H. Favrot • R. P. Gregory • Geo. A. Peterkin
OIL • GAS • GASOLINE • WATER PIPE LINES • 2707 FERNDALE, HOUSTON 6, TEXAS



THIS NEW BOOK

Tells How To

CONTROL or PREVENT RUST and CORROSION

with SOLVAY SODIUM NITRITE

and

Sodium Nitrite Mixtures

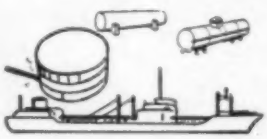
SOLVAY Sodium Nitrite provides a low-cost, safe and easy-to-use means of protecting many metals from rust and corrosion, primarily iron and steel. Dilutions as low as 1/10th of 1% will make water solutions non-corrosive; and 3 to 5% spray or dip solutions will produce protective films on metal surfaces. When combined with materials such as phosphates or caustic soda, sodium nitrite's protective action can be extended or obtained during cleaning, neutralizing or similar operations.

This new booklet contains detailed information on how SOLVAY Sodium Nitrite prevents rust and corrosion, and how its protective action can be utilized, either alone or in combination with other materials. It also contains an extensive bibliography covering 59 published papers on the use of sodium nitrite and nitrite compounds for corrosion prevention.

For your free copy, fill out and mail the coupon today. There is no cost or obligation.*

*In Western Hemisphere Countries.

A Few Typical Applications



Hydrocarbon service and fuel oil tanks

Air conditioners, heat exchangers and other circulating water systems

New or reconditioned drums, barrels or cans

Metal parts in process or storage

SOLVAY

SOLVAY PROCESS DIVISION
ALLIED CHEMICAL & DYE CORPORATION
61 Broadway, New York 6, N. Y.

Allied Chemical

BRANCH SALES OFFICES
Boston • Charlotte • Chicago • Cincinnati • Cleveland
Detroit • Houston • New Orleans • New York
Philadelphia • Pittsburgh • St Louis • Syracuse

GET THE FACTS—MAIL COUPON NOW!

SOLVAY PROCESS DIVISION
Allied Chemical & Dye Corporation
61 Broadway, New York 6, N. Y.

Gentlemen: Please send me without cost or obligation*

- ☐ Your new book "SODIUM NITRITE for Rust and Corrosion Prevention"
- ☐ Sample of SOLVAY Sodium Nitrite

Name _____

Company _____

Title _____

Address _____

City _____ Zone _____ State _____ DZ-3

Soda Ash • Snowflake® Crystals • Potassium Carbonate • Calcium Chloride • Caustic Potash
Sodium Bicarbonate • Ammonium Bicarbonate • Cleaning Compounds • Ammonium Chloride
Sodium Nitrite • Chloroform • Caustic Soda • Monochlorobenzene • Para-dichlorobenzene
Ortho-dichlorobenzene • Chlorine • Methylene Chloride • Methyl Chloride • Carbon Tetrachloride

Think of what this means to operators of FLOATING ROOF TANKS!

Elimination of potential vapor-loss and preservation of product quality, the most important reasons for a floating roof tank, are now reality . . . the **HAMMOND TUBESEAL,*** for floating roof tanks of welded or riveted construction, provides the most efficient and positive seal known . . . sealed at a point to prevent vapor space between roof, rim and shell, thus there is no room for vapors to form or for the product to come in contact with outside influences and be contaminated . . . the **TUBESEAL*** has no moving parts, requires no maintenance, adjusts for tank out-of-roundness, is climate proof and non-corrodible, can operate to bottom of tank or above the top . . . **ITS ENTIRE CIRCUMFERENCE IS TIGHTLY SEALED UNDER PRESSURE AT ALL TIMES . . . NO VAPOR SPACE BELOW THE SEAL.**

THERE'S NO ROOM FOR VAPORS TO FORM WITH THE HAMMOND TUBESEAL

THE **HAMMOND TUBESEAL*** HAS BEEN THOROUGHLY TESTED IN COMMERCIAL USE . . . IT IS **GUARANTEED** TO YOUR SATISFACTION.

HAMMOND TUBESEAL* COSTS NO MORE IN THE FIRST PLACE

*Copyright

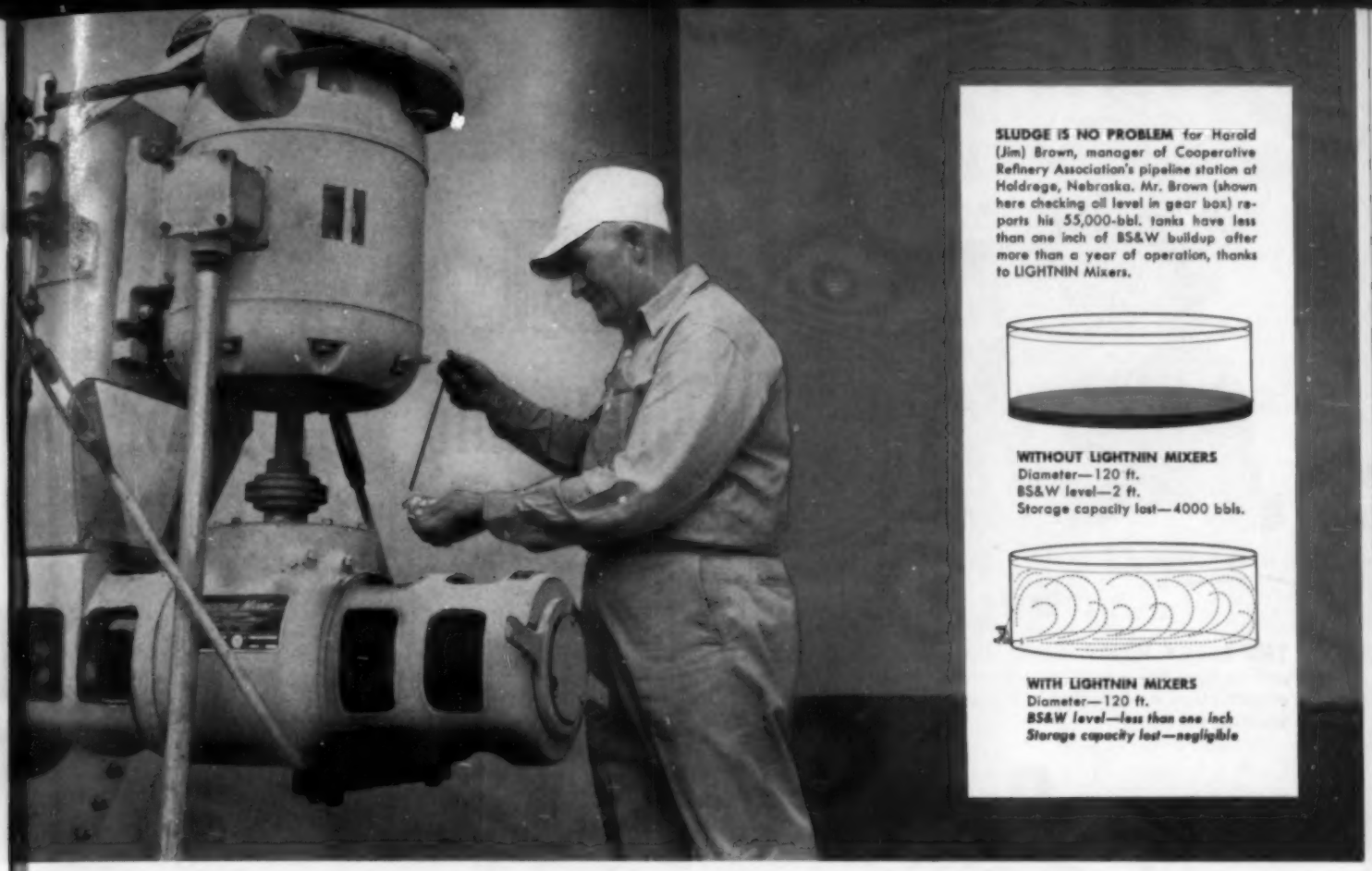
ask for Bulletin TS

CHEAPER OVER THE YEARS

HAMMOND IRON WORKS

WARREN and BRISTOL, PA. • PROVO, UTAH
CASPER, WYO. • BIRMINGHAM, ALA.

Sales Offices: NEW YORK 20 • AKRON • BOSTON 10 • BUFFALO 2 • CHICAGO 3 • CINCINNATI 2 • CLEVELAND 15 EL PASO • EUSTIS, FLA. • HOUSTON 2 • LOS ANGELES 14 • PITTSBURGH 19 • RICHMOND 20 • SAN FRANCISCO WASHINGTON 6, D.C. • HAVANA • MEXICO CITY • "TIPSA" BUENOS AIRES **Licensee in Cal.:** LACY MFG. CO., LOS ANGELES



SLUDGE IS NO PROBLEM for Harold (Jim) Brown, manager of Cooperative Refinery Association's pipeline station at Holdrege, Nebraska. Mr. Brown (shown here checking oil level in gear box) reports his 55,000-bbl. tanks have less than one inch of BS&W buildup after more than a year of operation, thanks to LIGHTNIN Mixers.

WITHOUT LIGHTNIN MIXERS
Diameter—120 ft.
BS&W level—2 ft.
Storage capacity lost—4000 bbls.

WITH LIGHTNIN MIXERS
Diameter—120 ft.
BS&W level—less than one inch
Storage capacity lost—negligible

Is sludge hogging your tank capacity?

Cooperative Refinery Association cleans tanks by flipping a switch. So can you.

Sludge is a tank hog. It eats up valuable tank capacity you badly need for crude. It's a messy tenant, too, and cleaning up after it is a costly, dirty job.

Rid your tanks of sludge, and you add as much as 12% more capacity to your pipeline stations.

Cooperative Refinery Association brings crude oil from Wyoming to its pipeline station at Holdrege, Nebraska, stores it in two 55,000-bbl. tanks. When the crude moves on to the refinery at Phillipsburg, it leaves a minimum of BS&W in the tanks. In more than a year of operation, scarcely an inch of sludge has accumulated in either tank.

Simple method pays off

Secret? Cooperative Refinery Association equipped each tank with a LIGHTNIN Side Entering Mixer. When temperature falls below 70°, these mixers go to work for about four hours a day. They keep bottoms stirred, prevent oil from congealing. When the oil moves on, each tank is ready to take on a new supply—without cleaning—and at full capacity.

LIGHTNIN Mixers are keeping storage tanks free of sludge at many pipeline stations, increasing storage capacity, eliminating downtime for cleaning, making every barrel in every tank merchantable crude oil.

Here's why you can't lose

You take no risk when you order a LIGHTNIN. Every one is unconditionally guaranteed to perform its job—or your money back.

Learn how LIGHTNINs can solve your sludge problems, make your tanks work harder, cut your costs. Call in your LIGHTNIN representative, or write us today.

Lightnin® Mixers

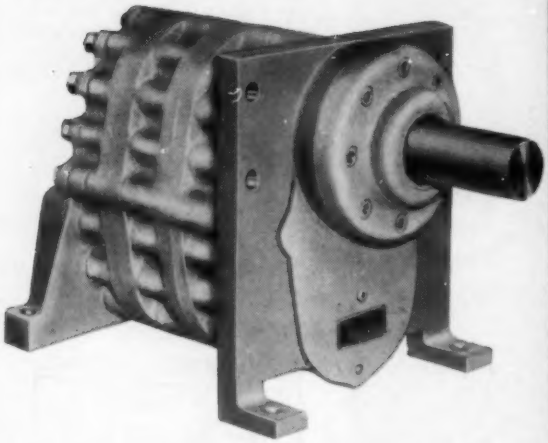
MIXCO fluid mixing specialists

Get these helpful facts on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with name and company address. Free—no obligation.

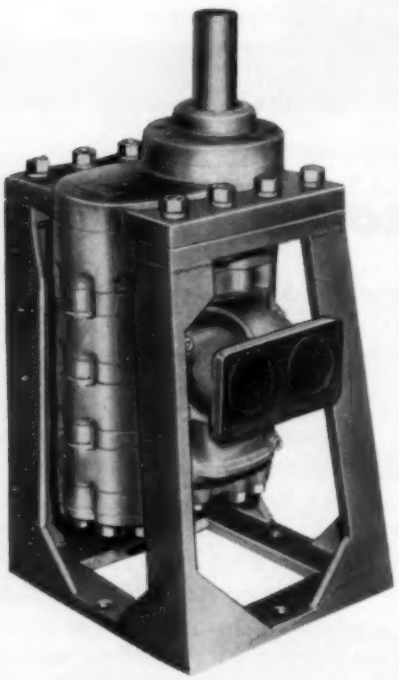
- ☐ B-503 Illustrated bulletin on BS&W control
- ☐ B-104 20-page catalog fully describing LIGHTNIN Side Entering Mixers
- ☐ B-107 Mixing Data Sheet
- ☐ B-110 Condensed Catalog describing LIGHTNIN Mixers of all types
- ☐ B-111 Bulletin describing LIGHTNIN rotary mechanical seals for extra-low-cost mixing

MIXING EQUIPMENT Co., Inc., 196-c Mt. Read Blvd., Rochester 11, N. Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Avenue, Toronto 10, Ont.



THE BERRY PUMP can be direct or belt-driven from the compressor flywheel. Rugged construction and over-size bearings guarantee long life.



THE BERRY MOTOR is supplied with a vertical mounting stand and *the fan can be mounted directly on the shaft.* Fans can also be belt-driven by the motor if desired.

WRITE for your copy of Bulletin FD-1 giving all data on selection and advantages of Berry Drives for Aerial Cooler Fans.

BERRY®

Hydraulic Drives for AERIAL COOLER FANS

FAN NEWS ★★★

Leading Utilities Choose BERRY Hydraulic Drives

Here's why **leading utility companies choose Berry Hydraulic Fan Drives:**

1. Water temperature held to plus or minus one degree with infinitely variable fan speed.
2. One Berry Pump can drive four Berry Motors, for cooling-water, oil, gas and driving an auxiliary.
3. Safe; no hazardous sparking with hydraulic drives!
4. Low original cost of equipment; no gear-boxes or electrical circuits.
5. Flexibility of installation through simplicity of design.
6. For unattended service, Berry Drives can be fully automatic.
7. Drive is integrated with compressor for ease of relocation!
8. Hydraulic operation saves power costs.

Write for locations of Berry Fan Drive Installations

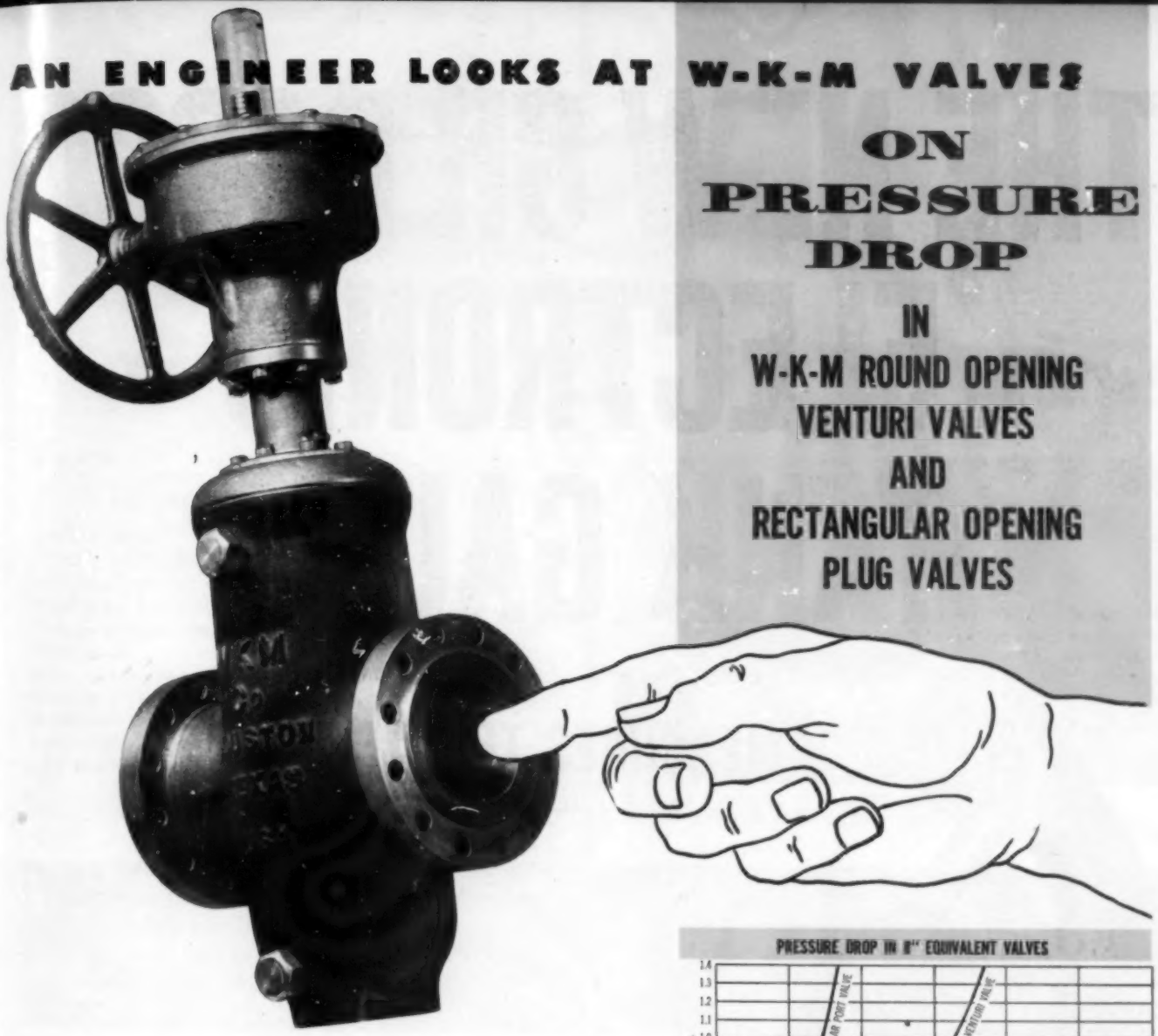
BERRY DIVISION **OLIVER IRON AND STEEL CORPORATION**

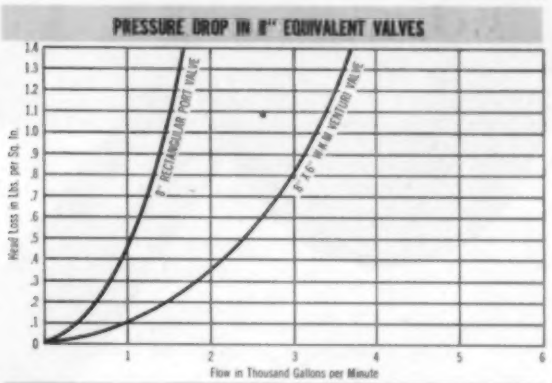
PITTSBURGH 22, PENNSYLVANIA

AN ENGINEER LOOKS AT W-K-M VALVES

ON PRESSURE DROP

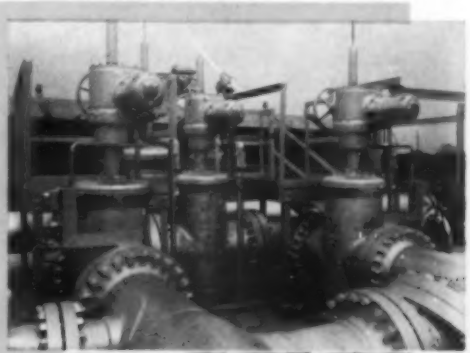
IN W-K-M ROUND OPENING VENTURI VALVES AND RECTANGULAR OPENING PLUG VALVES




PRESSURE DROP IN 8" EQUIVALENT VALVES
Head Loss in Lbs. per Sq. In.
8" RECTANGULAR PORT VALVE
8" x 6" W-K-M VENTURI VALVE
Flow in Thousand Gallons per Minute

You get 21% **less** pressure drop in W-K-M Venturi Valves than in rectangular opening plug valves as shown by the pressure drop chart at right. **And,** in equivalent sizes, W-K-M Venturis cost the same or less than plug valves.

You're way ahead when you specify W-K-M —not only do you get far greater transmission efficiency, but you get leverlock operation, positive seal on both sides, spot lubrication at seat, and other advantages, all of which have made W-K-M Valves first on the world's major pipelines.



W-K-M Valves

W-K-M MANUFACTURING COMPANY, INC.

A SUBSIDIARY OF a.c.f. INDUSTRIES INCORPORATED

P. O. Box 2117, Houston 1, Texas Los Angeles, California

Export Office: 45 Rockefeller Plaza, New York, N. Y.

THE NEW GILBARCO ELECTRONIC TANK GAUGE

MEASURES THIS ACCURATELY...

The Gilbarco Electronic Tank Gauge gives you accuracy to within *1/16th of an inch plus* or *minus* — the thickness of a quarter! This gauge actually measures electronically — not with a float. It is the only gauge today that offers you all these time- and money-saving advantages:

★ At least 100% more accurate than hand gauging, or any other automatic gauge

★ Capable of remote transmission with equal accuracy

★ Equipped with positive operational checks for assurance of accurate performance

★ Can be supplied with *automatic switches* for selecting proper resistance in averaging temperature instruments.

Automation **in Liquid Level Gauging is brought to Refineries, Pipe Lines and Terminals with the Gilbarco Electronic Gauge.**

Write now for illustrated brochure with full details.

Gilbert & Barker Mfg. Co.
West Springfield, Mass.

Gentlemen:

Please send me brochure on the Gilbarco Electronic Tank Gauge.

NAME _____

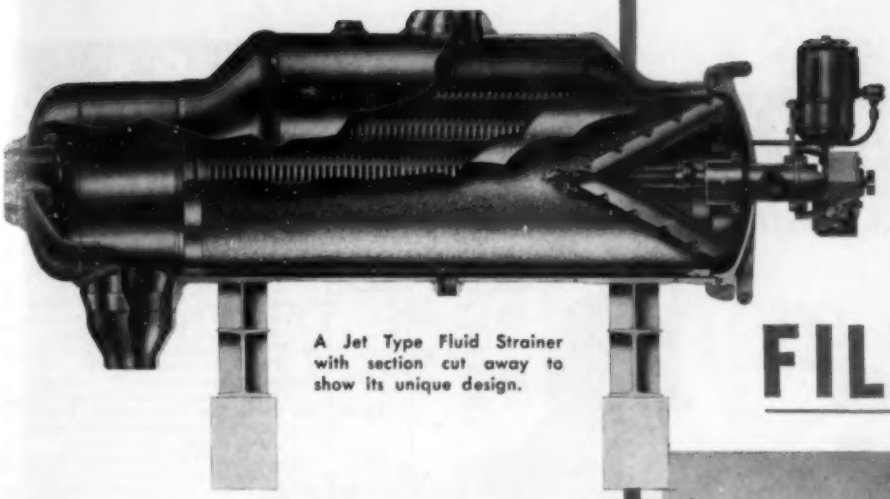
COMPANY _____

ADDRESS _____

CITY _____ **STATE** _____

Gilbarco

Gilbert & Barker Mfg. Co.,
West Springfield, Mass.,
Toronto, Canada

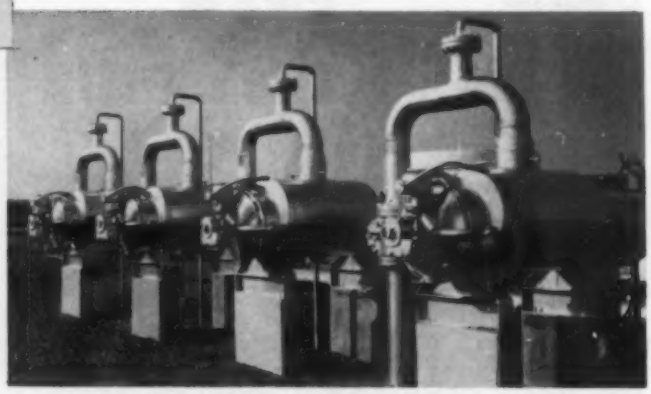


A Jet Type Fluid Strainer with section cut away to show its unique design.

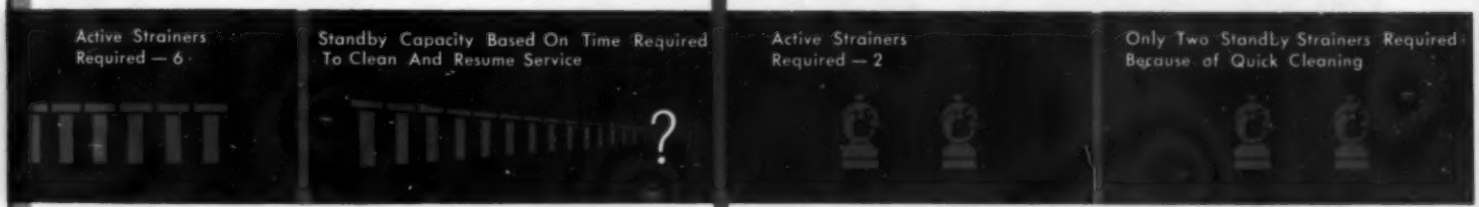
WHAT PRICE FILTRATION?

Let's examine two installations required to handle 60,000 bpd: One with conventional vertical sock type strainers of approximately 10 square feet of filter area each; the other with Jet Type Horizontal Strainers of approximately 30 square feet of filter area each.
Required: One square foot of filter area per 1,000 bbls. per day or a total of 60 square feet of filter area with **adequate** standby capacity to assure no by-passing, at any time, of dirty strainers, or pipeline shutdown time for cleaning strainers.

OBJECTIVE: To filter all the product, all the time.*



An installation of four, 30,000 bpd capacity Jet Type Strainers on a new products pipeline.


Active Strainers Required — 6
Standby Capacity Based On Time Required To Clean And Resume Service
?
Active Strainers Required — 2
Only Two Standby Strainers Required Because of Quick Cleaning

INSTALLATION REQUIREMENTS

1. Valves — 3 Per Strainer
2. Extensive Manifolding
3. Installation Labor — Maximum
4. Overhead Crane for Lifting Closure and Basket
5. Sump
6. No Recording Instruments

STRAINER MAINTENANCE

1. Cleaning — Remove Closure and Replace Felt Manually. (Two Men 30 Minutes, 1 Man-Hour)
2. New or Reconditioned Felt Required for Each Cleaning
3. Replacement of Collapsed Strainer Elements Due to Excessive Pressure
4. No Automatic Operation Possible

*The expense of complete filtration is more than justified by the prevention of damage to closely fitted mechanical devices necessary to the operation of a pipeline.

INSTALLATION REQUIREMENTS

1. Valves — 3 Per Strainer
2. Less Manifolding
3. Less Installation Labor
4. No Overhead Crane
5. Sump
6. Pressure Differential Recording Gauge to Assure Daily Record of Pipeline Operation.

STRAINER MAINTENANCE

1. Cleaning Accomplished By One Man in **Less Than 5 Minutes** Without Opening Strainer
2. Stainless Mesh Screen Lasts Indefinitely
3. Alarm System Prevents Damage to Strainer Element Due to Excessive Pressures
4. Can Be Made Fully Automatic

ADDITIONAL OPERATING ADVANTAGES OF JET STRAINERS

1. Stream can be cleaned to any desired degree — 100, 200, 325, or 400 mesh screens optional.
2. Can be made fully automatic for operation at remote station.
3. Greater Safety — Strainer is cleaned without opening, consequently workmen are not subjected to danger of fumes and fire.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS

Construction moves faster with

LONE STAR LINE PIPE

Skilled workmen who laid a recent new crude oil line in Oklahoma were outspoken in their praise of Lone Star's line pipe. The sharp hills and deeply cut ravines of the Oklahoma landscape were extreme tests in bending quality and workability. Up to 40 degree bends in 50-foot sections caused not a single buckle.

Lone Star helped shorten the construction schedule. One veteran said, ". . . in no time, you're around the joint with a perfect weld – ready to move on."

Lone Star is the vast, new, permanent source of supply for the Mid-Continent oil and gas industry. Depend on Lone Star for API specification line pipe, casing and tubing. Quick delivery!

Lone Star STEEL COMPANY

LSS

EXECUTIVE SALES OFFICES
W. Mockingbird Lane at Roper • P. O. Box 8087 • Dallas, Texas

DISTRICT SALES OFFICES	E. B. GERMANY WORKS	COAL MINES
Houston, Texas Tulsa, Oklahoma	Lone Star, Texas	McAlester, Oklahoma McCurtain, Oklahoma

WHO'S MEETING WHERE

MAR. 4	Southern Gas Association, Transmission Management Conference, Shamrock Hotel, Houston.
7- 9	Mid-West Gas Association, St. Paul Hotel, St. Paul, Minn.
7-11	National Association of Corrosion Engineers, Palmer House, Chicago.
17-18	Southern Gas Association, Distribution Management Conference, Jung Hotel, New Orleans.
21-23	AGA, General Management Section, Netherland Plaza, Cincinnati.
23-24	Pacific Coast Gas Association Accident Prevention Conference, Santa Barbara.
24-25	American Gas Association, Gas Supply, Transmission and Storage Conference, Wm. Penn Hotel, Pittsburgh.
24-25	NEGA Annual Meeting, Hotel Statler, Boston.
APRIL 3- 8	API Safety and Fire Protection Committees, Jung Hotel, New Orleans.
5- 7	Corrosion Control Short Course, University of Oklahoma, Norman.
12-15	American Gas Association Distribution, Motor Vehicles and Corrosion Conference, Netherland Plaza, Cincinnati.
13-15	National Petroleum Association, Cleveland Hotel, Cleveland.
18-19	AGA Residential Gas Section, Eastern Natural Gas Regional Sales Conference, Hotel William Penn, Pittsburgh.
18-20	American Society of Mechanical Engineers, Lord Baltimore Hotel, Baltimore.
19-20	Pacific Coast Gas Association, Distribution Conference, Phoenix.
19-20	Southwestern Gas Measurement Short Course, University of Oklahoma, Norman.
20-22	Indiana Gas Association Annual Meeting, French Lick Springs Hotel, French Lick, Ind.
20-22	Petroleum Industry Electrical Association and Petroleum Electric Supply Association, Joint Conference and Exhibit Show, Shamrock Hotel, Houston.
27-29	AGA Research and Utilization Conference, Hotel Statler, Cleveland.
MAY 1- 4	Liquefied Petroleum Gas Association, Conrad Hilton Hotel, Chicago.
2- 3	Pacific Coast Gas Association, Transmission Conference, Palm Springs, Calif.
2-13	British Industries Fair, London and Birmingham, England.
9-10	American Gas Association, Gas Supply, Transmission and Storage Conference, Hotel William Penn, Pittsburgh.
11-12	Pacific Coast Gas Association, Gas Supply and Transmission and Conference of Technical Session, Palm Springs, Calif.
16-18	American Petroleum Institute, Division of Transportation, Products Pipe Line Conference, Edgewater Beach Hotel, Chicago.
16-18	Southern Gas Association, New Orleans.
17-19	Pennsylvania Gas Association, Pocono Manor, Penn.
30-	Chemical Institute of Canada, Quebec City, Que.
JUNE 1- 3	Annual Short Course in Gas Technology, Texas College of Arts and Industries, Kingsville, Texas.
5- 9	Canadian Gas Association, Annual Meeting, Sheraton Brock, Niagara Falls, Ont.
6- 9	American Society of Mechanical Engineers, Oil and Gas Power Division, Hotel Statler, Wash.
6-15	Fourth World Petroleum Congress, Rome, Italy.
9-10	Natural Gas and Petroleum Association of Canada, Royal Connaught, Hamilton, Ont.
11-15	Petroleum Equipment Suppliers Assn., Banff Springs Hotel, Banff, Alberta.
13-17	American Society of Civil Engineers, Committee on Pipelines, St. Louis.

Announcing...

A New Bethlehem Product

EXPANDED

LINE PIPE

With the installation of facilities for hydraulic expansion well under way at the Steelton, Pa., plant, Bethlehem Steel Company will soon be able to furnish an unusually wide range of welded, large-diameter line pipe to the oil and gas industries. We invite your inquiries.

HIGH-TEST LINE PIPE

Cold expanded, electric-fusion-weld line pipe meeting API 5LX specifications, in diameters from 18 in. to 36 in. Available in 40-ft lengths and in wall thicknesses to ⅝ in. Bethlehem is also equipped to coat pipe exteriors and interiors.

HIGH-STRENGTH PIPE

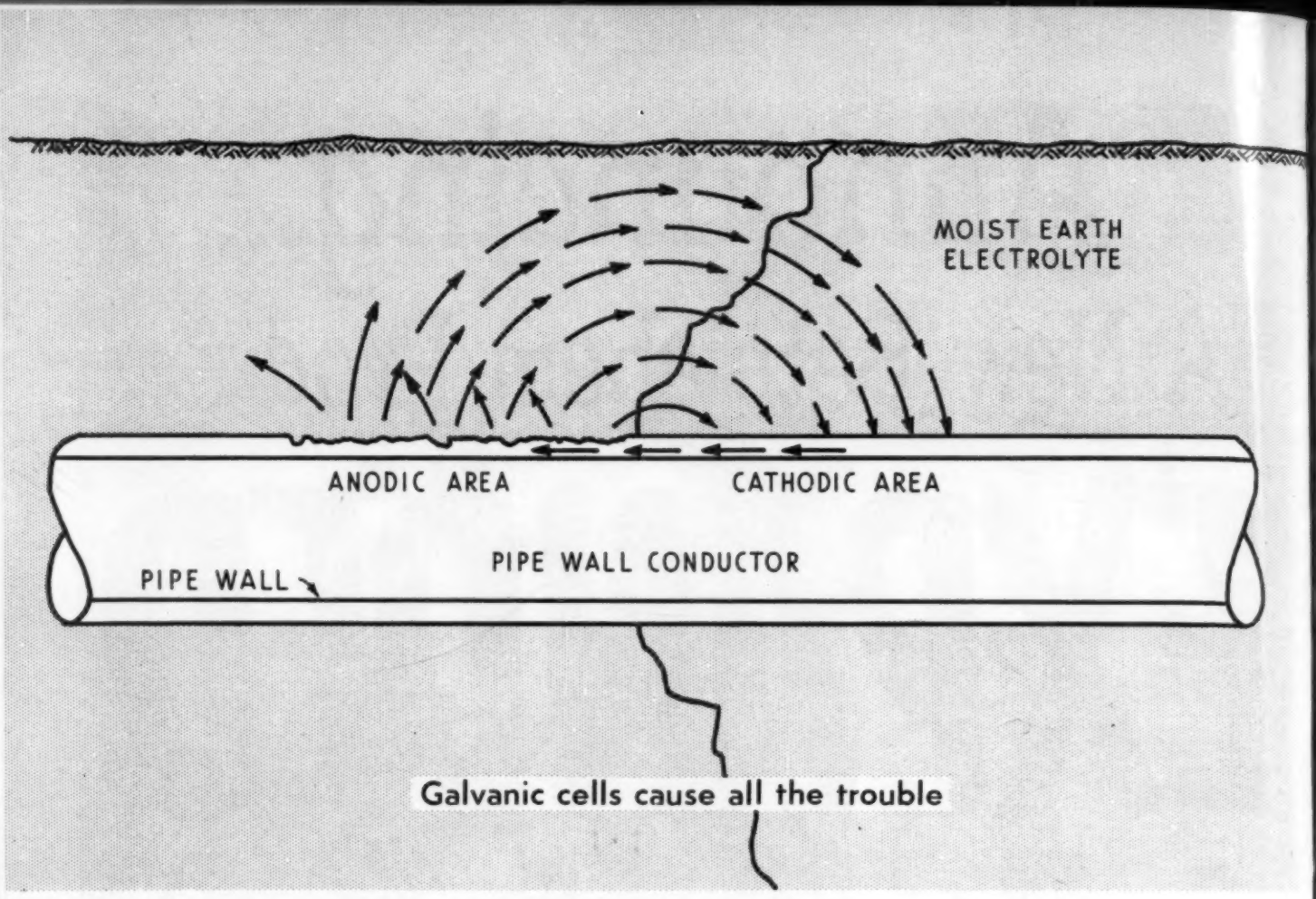
Pipe fabricated from alloy steels such as high-strength, low-alloy Bethlehem Mayari R steel plate (50,000 yield). This pipe is immediately available as rolled in 40-ft lengths and in wall thicknesses as required. All diameters from 18 in.

BETHLEHEM STEEL

For further information about Bethlehem Oil & Gas Pipe, please contact the Bethlehem sales office nearest you.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation



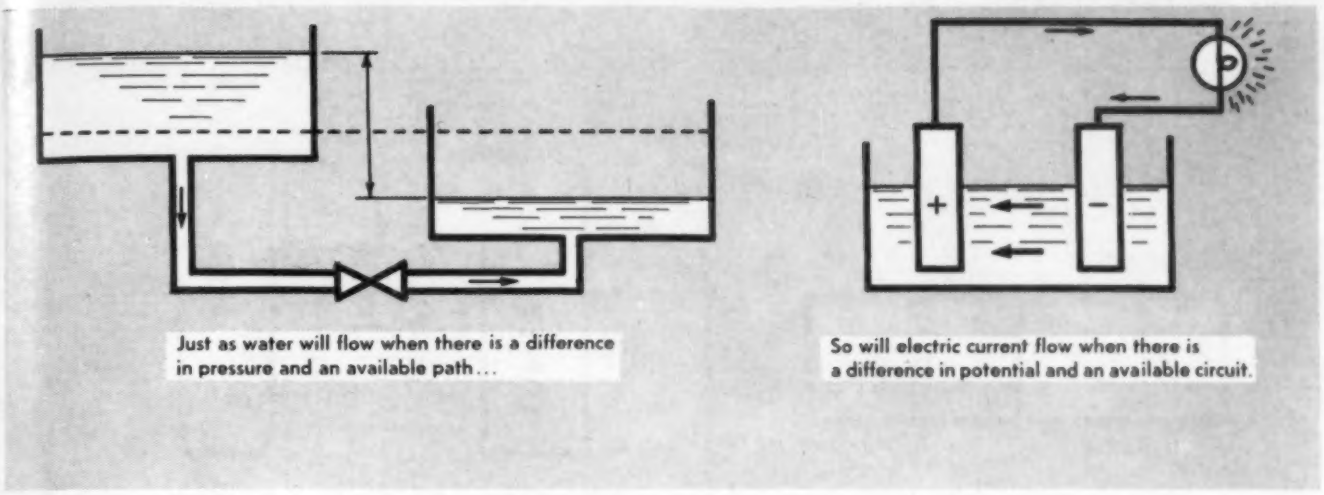
Here Is Why Pipe Lines Corrode

If there were such a condition as perfectly homogeneous pipe laid in homogeneous soil of uniform dampness, underground corrosion would not take place. But differences set up battery action and cause trouble.

By MAURICE A. RIORDAN, President, Rio Engineering Company, Houston

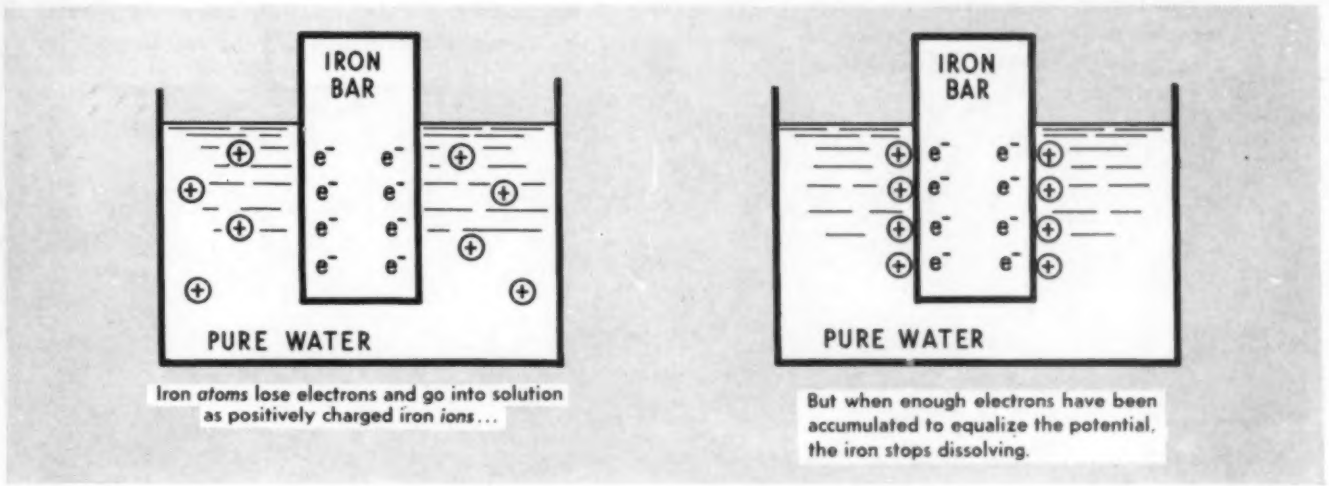
EXPERIENCE HAS shown that most steel structures in soil or water suffer from corrosion attack. Basically, this is a result of a strong tendency for iron to revert to its natural form. Iron exists in nature in great abundance—it makes up, in fact, about 5 percent of the earth's crust. But its natural form is never that of pure iron. It is always found in combination with other elements, as for example, in the common iron oxide. This ore is converted by man through a variety of smelting or refining processes from its natural combined state to a commercially pure form such as steel, cast iron, or any of a large number of alloys. When this pure form is then exposed to soil or water, it is not unreasonable to expect that the iron will show a tendency to revert to a combined form which is more "natural" to its environment. This reversion process, when it takes place on a steel structure, is recognized as rust or corrosion.

Corrosion is electrochemical. This corrosion is the result of an electrochemical process. Chemical because a chemical change takes place; electric because the flow of an electric current is involved; and electrochemical because the two processes are dependent upon each other and occur simultaneously. The rust which forms is tangible, weighable evidence that chemical action takes place. The electric part of the process is not so obvious. Neither



Just as water will flow when there is a difference in pressure and an available path...

So will electric current flow when there is a difference in potential and an available circuit.



Iron *atoms* lose electrons and go into solution as positively charged iron *ions*...

But when enough electrons have been accumulated to equalize the potential, the iron stops dissolving.

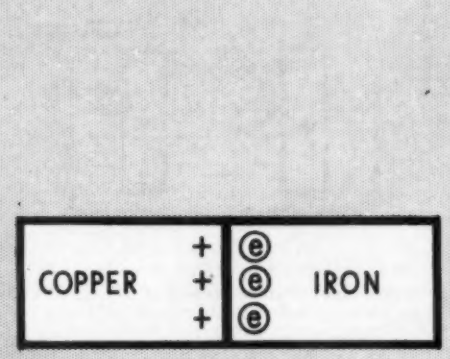
the existence of the currents nor the reason for their flow is immediately apparent. What causes the current to flow and what are the effects produced?

The basic principles which account for liquid flow in a hydraulic system also explain current flow in an electrical system.

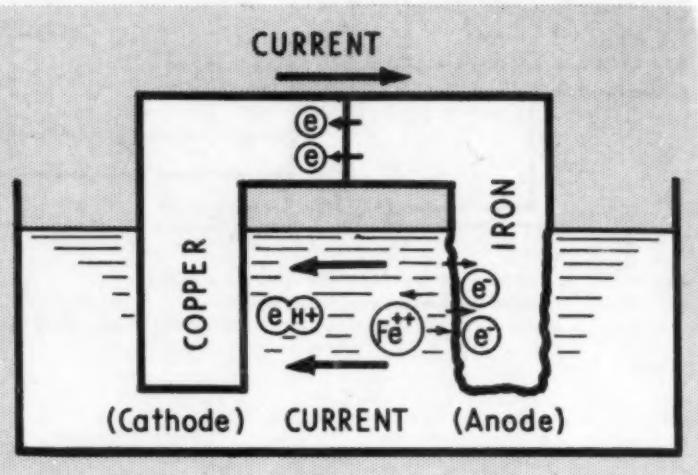
Hydraulic analogy. Water will always flow from one vessel to another when two conditions exist: (1) a difference in pressure between the two, and (2) an available channel for the flow. The flow will be related to the magnitude of the pressure difference and to the resistance offered by the channel. In an exactly similar manner, there will be a flow of electrical current between two terminals when there exist (1) a difference in potential (electric pressure) and (2) an available conducting path for the current. Also, the quantity of current flow will be related to the magnitude of the potential difference and the resistance of the path. But this merely illustrates the action of, but does not explain, the source of the potential difference.

Potential difference. It is characteristic of metals that a potential difference (due to the number and distribution of the electrons in the atom) exists between a piece of the metal and water in contact with its surface. In order to equalize this potential difference, iron goes into solution. When a metal goes into solution, the particles which enter the water are called "ions". They differ from the atoms of the metal in that having lost one or more electrons they are positively charged. As these positively charged ions enter the solution, they leave behind an increasing negative charge on the iron bar. If and when the charge accumulates to an amount equal to the originally existing solution potential of the iron, the action will come to a stop. Then there is no longer a potential difference to make the current flow. When pure iron and pure water are used, the number of ions lost is so small that no visible attack occurs. Any action which will remove the electrons from the iron bar or the ions from the solution will maintain the potential difference and sustain the corrosion process.

Battery action. Dissimilar metals, when bonded together, exhibit a difference in affinity for electrons. This shows up as a difference in potential (contact potential). Copper, for example, has a greater affinity for electrons than does iron. Thus if a copper bar is connected to an iron bar, there will be a momentary flow of electrons (an electric current) until the forces are balanced. If, however, the copper is in contact with a solution (or water) which also contacts the iron, then positive ions in the



When two different metals are joined together there is a momentary flow of electrons to the junction, but equilibrium is established quickly.



When both metals contact water, however, the equilibrium is upset and the action is continuous with corrosion of iron taking place.

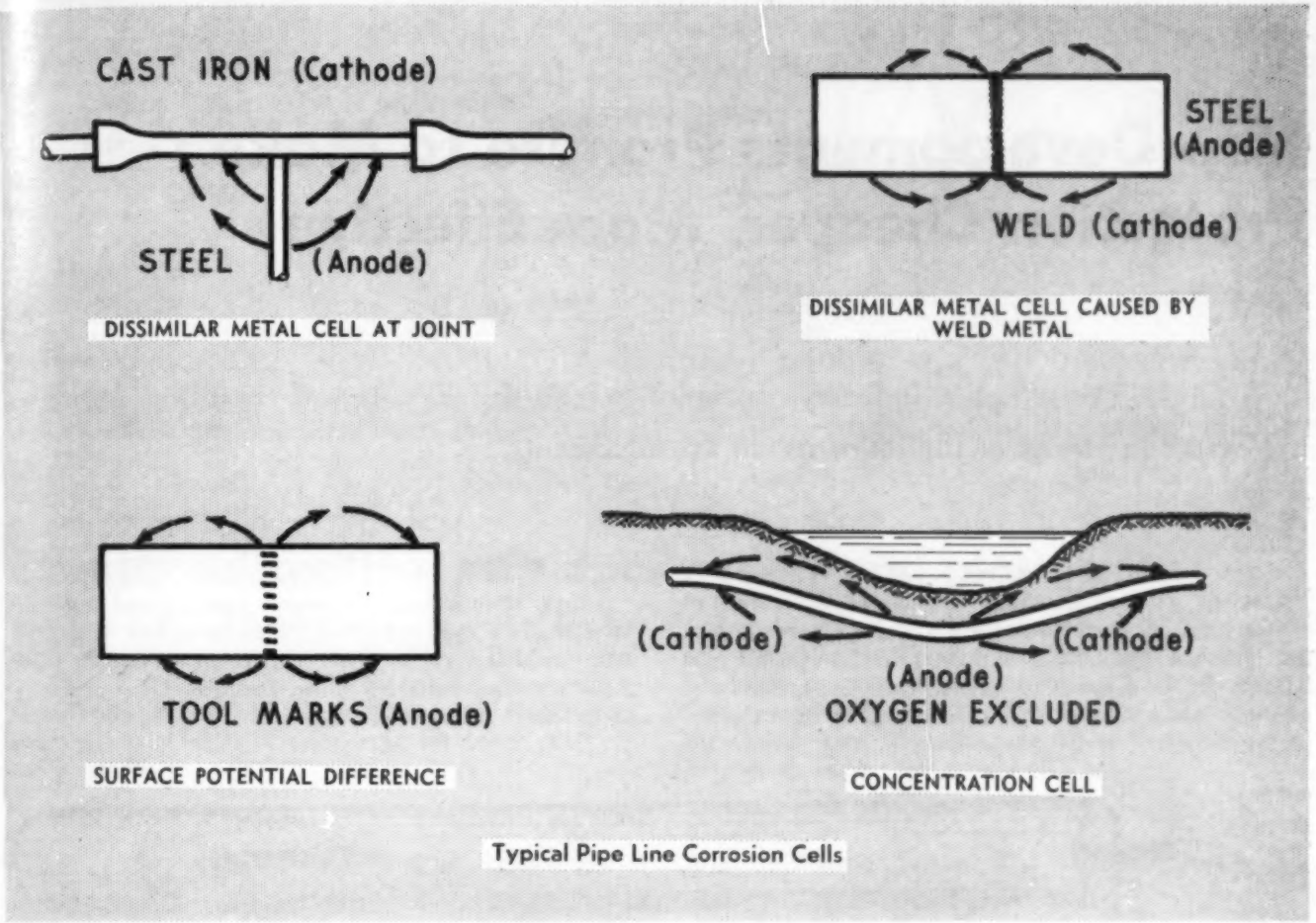
water will drain away the electrons from the copper. Positive ions are always present in water; very few in pure water, vast numbers in water which contains dissolved matter. This action will upset the equilibrium in the system, current will continue to flow, iron will go into solution, and there will be continuous corrosion of the iron. This whole activity is referred to as a "battery action."

Anodes and cathodes. It is to be noticed that there is a continual flow of electrons through the metallic path provided by the iron and the copper. This is an electric current similar to that which flows through any wiring circuit. The flow of electrons through an all-metal path does not involve any chemical or physical change (except for some heating effect) and thus does not involve corrosion. However, when a part of the path is non-metallic (electrolytic) a chemical change takes place at the junction of the two paths. The metal (electrode) from which ions enter the solution is referred to as the anode. It is at the anode (the iron in our example) that corrosion occurs. The other metal terminal, where electrons are available but no ions are formed, is called the cathode.

The principles involved in the electrolytic battery action described can be utilized to advantage in the design of batteries. These same principles operate to a disadvantage in being responsible for the corrosion of buried and submerged steel structures. When this battery action takes place on such structures, it is the result of one or more corrosion cells. A corrosion cell exists when there are (1) an electrical pressure or potential difference; i. e., an anode and a cathode; (2) a metallic connection between them; and (3) a non-metallic path that will conduct current (electrolyte) in contact with both anode and cathode all present in a common system.

Dissimilar metals cell. The battery action previously described illustrates a typical corrosion cell involving dissimilar metals. In a naturally occurring electrolyte such as soil or water, a corrosion cell exists whenever one metal is connected metallically to a different metal. For example where steel is bonded to copper, cast iron, or even to another type of steel.

Corrosion cells also occur on systems containing only a single metal (or alloy). Steel, for example, often exhibits wide potential differences between different parts of the surface (surface potentials), due to manufacturing or handling processes, heat treatment, stresses, etc. Some apparent surface differences which may be responsible for potentials are mill scale, tool marks, corroded areas, threaded sections and the like. The impurities present in commercial steel are also capable of setting up potentials which may lead to corrosion. The metallic path is the pipe wall, and the soil or water is the electrolyte. All the conditions are thus present and corrosion follows.



Typical Pipe Line Corrosion Cells

Concentration cell. Electrical "pressures" or potential differences can also result from other differences—differences in the chemical composition of the soil or water, and differences in the amounts of the dissolved substances present. These conditions create a type of corrosion cell which is known as a "concentration cell". Soils, in particular, vary widely in chemical composition, in moisture content, and in the degree of aeration; the soil can never be considered a uniform or homogeneous environment. These differences, in forming a corrosion cell, cause some areas of the metal to act as anodes and others to behave as cathodes.

Evaluation of corrosion circuit. In any kind of corrosion cell—or in a deliberately manufactured battery—there is a definite relationship between the rate of current flow and the rate of metal loss. This ratio, known as the "electrochemical equivalent", varies for different metals; for iron (or steel) the discharge of one ampere of current results in the solution of approximately 20 pounds of metal per year. The current flow, and hence the metal loss, will be determined by the magnitude of the potential difference and by the total resistance of the current path.

In relating total current flow to loss of mechanical strength resulting from corrosion the extent of the anode area must be considered to evaluate pitting.

The electrolytic portion of a pipe line corrosion cell is the soil or water in which the pipe lies. This is the major part of the total circuit resistance. Therefore the nature of the soil is a very important factor in pipe line corrosion. Soil resistivity can and does vary widely from area to area, and often from spot to spot even within a small distance. The lower resistivity soil will support current flow and hence may be considered as more corrosive.

All three of the elements (1) an anode and a cathode, (2) a continuous metallic path, and (3) an electrolyte in contact with anode and cathode, must exist in order for a corrosion cell to function. If any one of these is eliminated the cell will become inoperative. This then is the basis for corrosion control methods. Coatings, for example, are designed to separate the anode and cathode from the electrolyte by an inert insulating material. Insulating flanges can interrupt the metallic path of some corrosion cells. Cathodic protection transforms the anodic areas into cathodic areas and renders them inactive from the corrosion standpoint. Inhibitors (not usually applicable to soil corrosion) may modify the electrolyte or may stimulate the production of surface films.

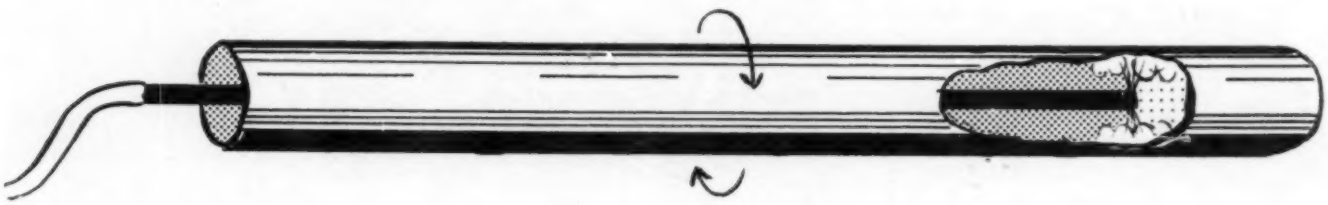
Electrical measurements can be applied to the corrosion process since there is a direct relation between corrosion and the associated electrical action. Experienced interpretations of these measurements are invaluable in corrosion investigation and design of effective corrosion prevention systems. —**The End**

New Developments Promise to Make Protection Cheaper, More Effective

The pipe line industry continues to lead the way in anti-corrosion engineering. Here are some of the more recent advancements.

ONE OF THE outstanding scientific advancements of recent years has been the control of corrosion in the pipe line industry. The billions of dollars worth of buried pipe lines in the U. S. will last almost indefinitely, thanks to corrosion mitigation practices developed in recent years.

During the past year, scientists, engineers and pipeliners have made a number of advances—some still in the test stage—which may lower the cost of protection or make the control of corrosion more effective. Here are some of the more recent ones.



1. Internal coating at pipe mills with epoxy resin . . .

TRANSCONTINENTAL GAS Pipe Line Corporation is having more than 200 miles of 30 and 36-inch pipe line internally coated with epoxy resin at the pipe mills. The work started in February and will continue through March.

This resin is one of the wonder plastics which can resist the chemical attacks H_2S, most acids and all but the strongest alkalies and it is so tough that when two sheets of aluminum are glued together with it, the aluminum will tear before the resin. (See Page 79, September, 1954, PIPE LINE INDUSTRY.) Also, when epoxy is used as a binder, for glass wrap, the resulting material may have as much as 65,000 to 72,000 pounds per square inch tensile strength.

In tests, Transco found that if the resin was applied to chemically treated pipe, subsequent bending would not affect the coating. However, when the pipe is welded, about a half-inch ring of the coating is destroyed by the heat.

Here is the way the coating is applied at the mill. First the pipe which is made of pickled skelp is chemically cleaned, first with a hot caustic bath, then an acid bath and a neutralizer. After the pipe is dry, the resin and its amine curing agent are sprayed internally as the pipe is rotated. After it has cured for seven days, the coating is so tough that an ordinary pocket knife will not cut to bare metal.

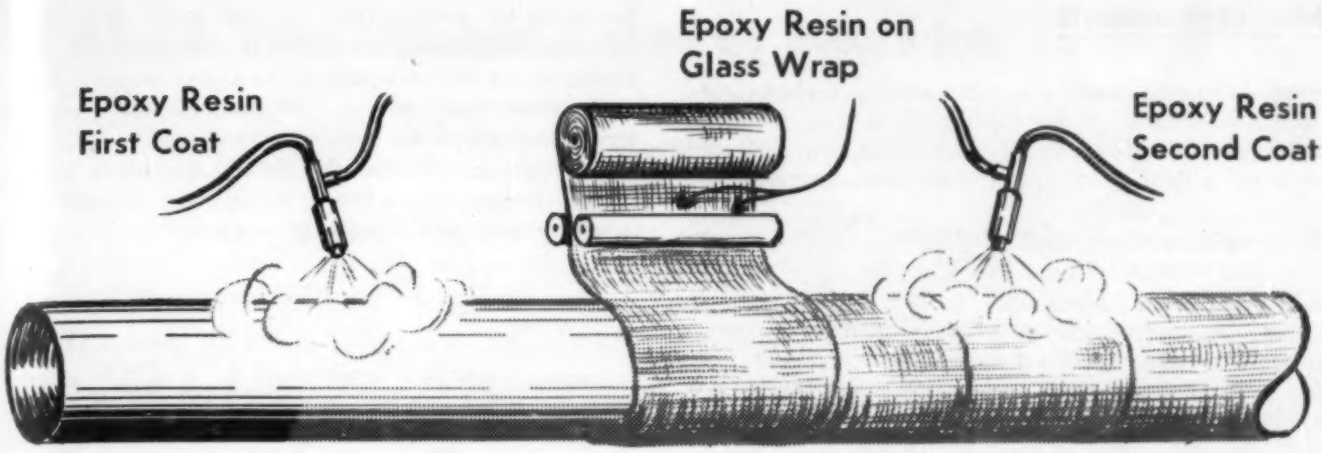
Transco engineers are making no predictions as to the advantages which might be realized from this coating. However, the editors of PIPE LINE INDUSTRY feel that there might be several advantages:

- **Cheaper hydrostatic testing.** When non-coated pipe is subjected to high hydrostatic pressures, water is driven into the mill scale and iron oxide normally found in the pipe. It requires an extreme amount of pigging to remove this water. If the coated pipe can be cleaned with fewer pigs, it will mean a savings in gas and time.

- **Less internal corrosion during storage.** Pipe in storage usually is coated externally but not internally. Along the Texas Gulf Coast this corrosion from salt breezes can be expensive and wasteful. This coating eliminates this.

- **Possible improved friction factor.** Only subsequent tests will show whether or not this advantage will be realized.

- **Cleaner lines.** The slick surface of the resin coating makes dirt easy to remove and the elimination of mill scale may minimize the need for scrubbers.



2. External coating with epoxy resin and glass wrap . . .

AT LEAST ONE company will try externally coating pipe with epoxy resin and glass wrap this year. Present plans call for the pipe to be coated by the method shown above at the mill. Because of the toughness of the resin and glass, engineers believe the pipe can be bent in the field without damage.

During welding, about one inch of the coating will be damaged. Engineers plan to brush on a coating, and wrap it to protect it from mechanical damage while it is curing. The epoxy which is cured by an amine agent added to the resin just before application needs no air during the seven days required for curing.

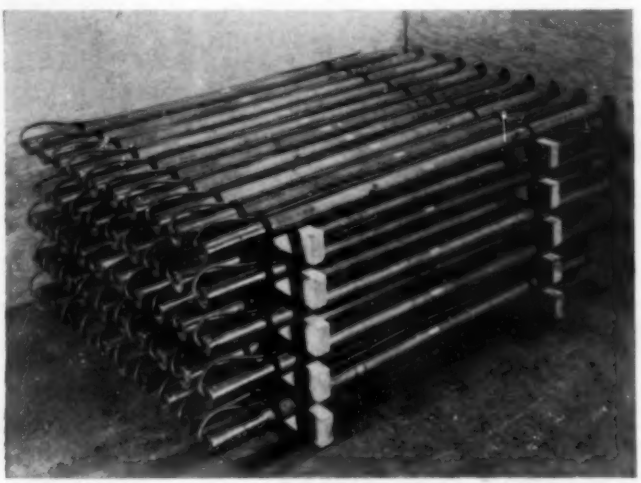
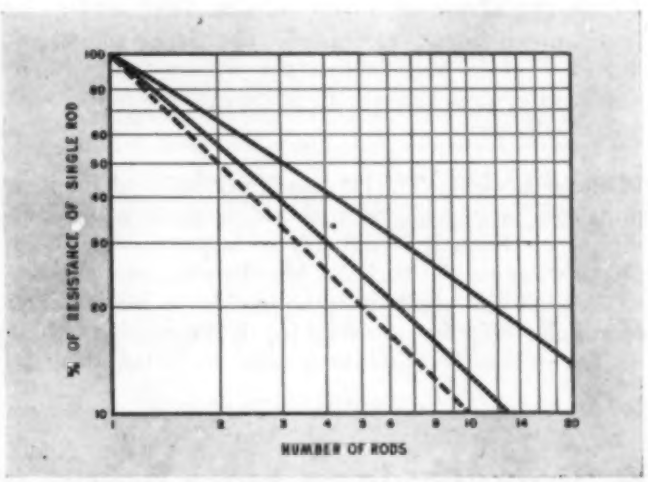


Photo Courtesy The Duriron Company, Inc.

HIGH-SILICON IRON ANODES. Rack of 50 2-inch by 60-inch anodes, with polyethylene insulated lead wires attached, ready for shipment. This is most popular size for bare installations. Weight is 46 pounds; total surface area 2.6 square feet.



TOTAL RESISTANCE of a number of anodes in parallel. Based on 12-inch diameter backfill (upper curve), 2-inch diameter bare anode (lower curve) and theoretical value with no mutual interference (lower dotted curve).

3. New inert cast-iron anodes being used . . .

THE RECENT introduction into the field of cathodic protection of inert anodes of high-silicon cast iron introduces some new possibilities, and at the same time some new problems of design. The data available from a number of test installations, combined with laboratory investigations and theoretical considerations, make it possible to present some tentative design standards and formulae.

This material (14.5 percent silicon cast iron) has been used in the form of anodes in various electrolytic processes for many years, in which service it behaves successfully as a relatively insoluble or inert anode. This history, together with the well-established high corrosion resistance of the material in many non-electrolytic applications, made it appear to be a promising material for use as the anode in impressed current cathodic protection systems. Several hundred anodes have been installed in a wide variety of soils and waters and numerous laboratory "barrel" tests have been conducted over a considerable

range of current densities and in a variety of electrolytes. It is now possible, on the basis of these tests, to design anode groups with an accuracy commensurate with that obtained with the older and better-known materials.

With carbonaceous backfill. The commercially available sizes of high-silicon iron anodes for installation in soil are 2-inch x 60-inch and 1½-inch x 60 inch. Some special sizes and shapes are available for special installations. When installed in well-tamped coke breeze backfill, the 1½-inch x 60-inch anode exhibits no appreciable difference in performance from a standard (3-inch x 60-inch) graphite anode in the same backfill. Resistance to earth is the same, being primarily a function of the backfill, as is the open-circuit potential with respect to the structure. Paralleling factors, again, are solely dependent upon the dimensions of the backfill mass. The anode rod, in effect, is merely a means of making electrical contact with the backfill, which constitutes the true anode.

This similarity of performance is found only when the backfill is properly and thoroughly compacted. Water in the hole makes proper tamping almost impossible. Caving or spalling of soil from the sides of the hole results in the inclusion of quantities of earth in the backfill. Either of these conditions results in some electrolytic conduction of current from the central anode, instead of mere transfer, by direct contact, to the backfill. High-silicon cast iron can withstand electrolytic discharge, at current densities up to one ampere per square foot without significant weight loss, and at densities much higher with only small losses.

Without backfill. The maximum utilization of the inert properties of high-silicon iron are obtained under conditions in which it is difficult or impossible to obtain properly compacted backfills. Marshy sites, or quicksand strata—soils in which it is impossible to maintain an open hole—offer few problems for the installation of bare anodes. It has been found feasible to install them by jetting or by pushing them (in soft soils) into a pilot hole made by driving a rod. Driving of the anode itself should be attempted with caution as this material is far more brittle than ordinary cast iron—although it is not so brittle as graphite.

For bare installation, the 2-inch x 60-inch size is favored because of its larger area. The resistance of a single anode of this size can be computed by

$$R = 0.0055\,\rho$$

where ρ is the soil resistivity in ohm-cm, measured by the four-pin method at a depth equal to, or slightly greater than, the depth at which the bottom of the anode will be set. This value is seen to be about 2½ times as great as the resistance of an anode in 12 inches of carbonaceous backfill 10 feet deep.

The comparison for a number of anodes, however, is less unfavorable to the bare anodes. Their smaller diameter means that at, say, 10-foot spacing, they are separated by 60 diameters; this means that the "crowding" effect is much smaller than with 12-inch backfills, which at the same spacing, would have a separation of only 10 diameters.

For example, at the spacing referred to above, approximately 30 of the 12-inch backfilled anodes are required for a resistance one-tenth that of a single anode; whereas only 13 bare 2-inch rods will give the same one-tenth resistance ratio. Again, comparing this time, equal numbers of anodes: in 1000 ohm-cm soil, the resistance of single anodes are, respectively 5.5 ohms for the bare 2-inch and 2.0 ohms for the backfill (12-inch). But the resistance of a set of 10 each, at 10-foot spacing are, respectively 0.68 ohms and 0.44 ohms; a ratio of considerably less than 2:1. For 20 of each type, the values are 0.37 ohms and 0.27 ohms in this soil.

It is not difficult to see that in many cases, the savings in installation costs can easily take care of the additional number of anodes needed for an equivalent resistance. This is clearly true in difficult soils but may also be true where backfill could be installed.

4. Polyethylene tape being applied by machine . . .

Among the interesting developments of the past year is that of a successful power machine for the application of oriented polyethylene tape over the ditch. This material has already demonstrated its quality, but application by hand or by manually operated wrapping machines is too slow for regular pipe line construction. The new machine removes these limitations; speeds up to 3000 feet per hour have been obtained on 8-inch pipe, although this pace has not yet been maintained for more than 30 minutes or so, simply because the rest of the spread has been unable to keep up.

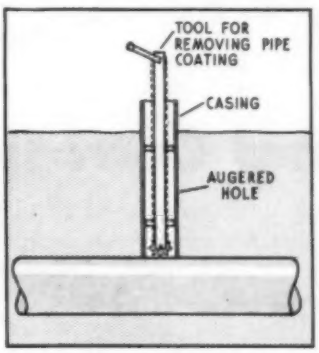
It is entirely feasible to build similar machines for any diameter pipe now being laid or contemplated, and there is no reason to believe that even better speeds could be obtained if needed. The smaller, hand-powered machines will continue to serve a useful function in the application of the tape to short sections of pipe.

5. Marine lines concrete-coated by steam jet . . .

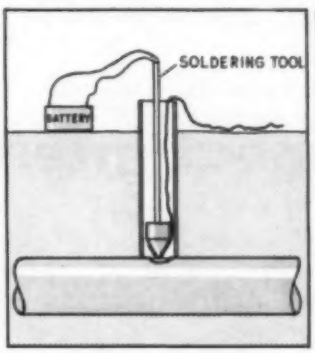
APPLICATION OF the outer weighting and protective coat of concrete to underwater lines by means of a steam jet is claimed to produce several additional advantages over conventional methods. The high density achieved is accompanied by a correspondingly high compressive strength, which confers added resistance to damage in handling. An accessory advantage of the high density is a lower moisture absorption rate. No special admix is used, except where even higher bulk density is required, in which case high-density aggregates may be substituted for all or part of the sand.

The reaction which takes place as concrete sets releases a certain quantity of heat; the usual effect of this is that the mass rises in temperature and then cools later, passing through this cycle while it is imperfectly set and thus subject to small fractures by the expansion strains set up. When applied by steam jet, the only effect of the reaction heat is to slow the cooling process somewhat. There is no reversal of temperature change until well after the setting process is virtually complete.

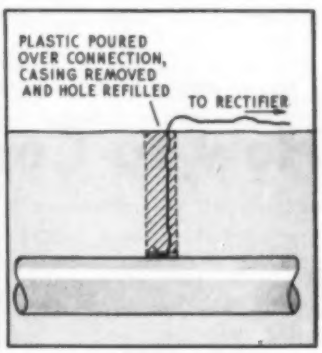
TEST LEADS quickly welded to buried pipe using "harpoon" thermit equipment.



MILLING CUTTER removes coating, wrap and other matter to prepare clean surface.



THERMIT HARPOON inserted in casing, welds test lead to buried pipe line.



WELD COMPLETED, lead is tested with sharp pull, casing removed, hole is filled.

6. Harpoon makes quick lead connections . . .

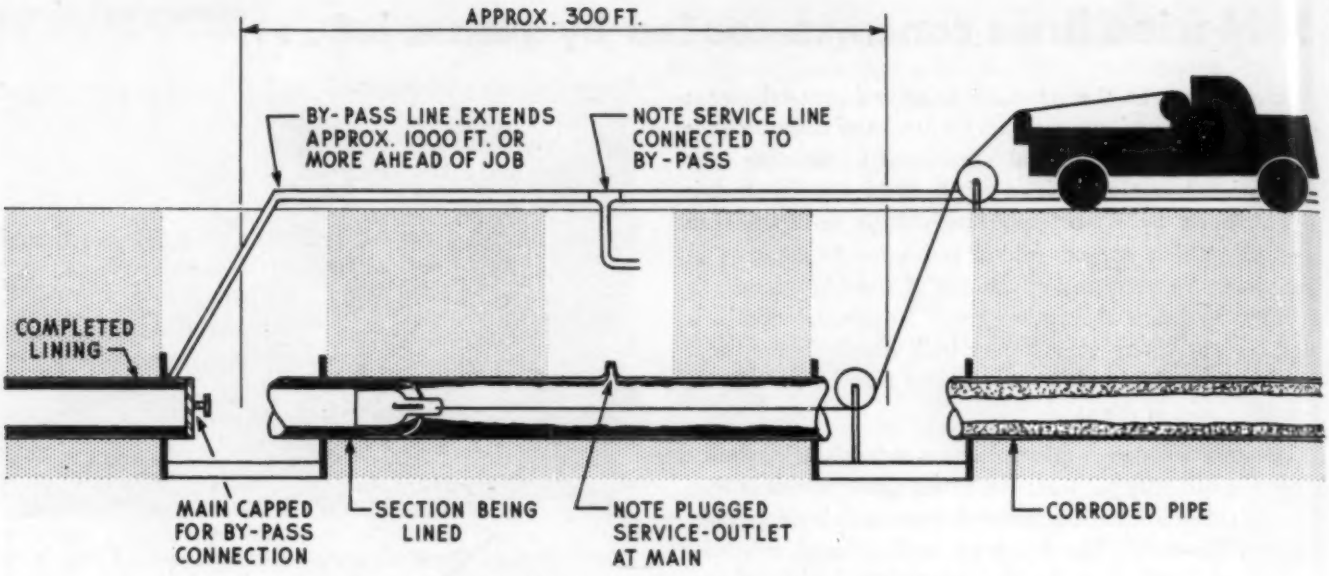
FOR CORROSION engineers faced with the problem of economically providing test or rectifier leads on buried lines, A. L. Stegner of Tennessee Gas Transmission Company, has developed a useful tool. Two men can easily carry all equipment necessary to dig a hole, clean the pipe weld area, and make the weld. Field applications have saved up to 58 man-hours per connection as compared to the old pick-and-shovel bell hole method.

"Harpooning" equipment consists of four basic tools and an interchangeable handle that fits three of them. An earth augur, having an extension handle is used to dig to the pipe and provide the hole for a three-inch casing. This casing is usually a section of aluminum pipe long enough to reach the pipe line and projects far enough above the ground to guide the other equipment.

When a hole is completed the casing is blocked in place on the pipe. A milling tool is then lowered into the casing to remove all wrap, coating, and foreign material from exposed pipe surface. This tool consists of a rotating cutter on the lower end of a supporting frame having side guides for centering in the casing. A hand-driven chain rotates the cutter. A small clean-out bit may be run in the casing ahead of the cutting tool to remove earth and prevent the cutter from becoming clogged.

After the weld area on top of the pipe has been cleaned and milled, the welding cartridge unit is lowered into the casing to contact the bare pipe. The welding unit consists of an electric ignition wire in thermit compound packed in a case attached to the interchangeable handle. The handle permits application of force upon the welding unit at the time of ignition. A six-volt storage battery heats a high-resistance wire in the weld compound. Ignition leads extend to the surface along with the heavy test lead. The welding unit may be wrapped in plastic film and sealed to prevent pre-ignition when used in holes containing water.

Each lead weld is tested by a pull prior to removal of the aluminum casing and the hole is filled. This method of attaching leads to buried pipe lines offers many advantages. Time and money are saved. Equipment is light and readily portable, but often more important the landowner's fences and crops are not disturbed. Leads have been installed successfully under a variety of soil and terrain conditions. —**The End**


APPROX. 300 FT.
BY-PASS LINE EXTENDS APPROX. 1000 FT. OR MORE AHEAD OF JOB
NOTE SERVICE LINE CONNECTED TO BY-PASS
COMPLETED LINING
MAIN CAPPED FOR BY-PASS CONNECTION
SECTION BEING LINED
NOTE PLUGGED SERVICE-OUTLET AT MAIN
CORRODED PIPE

IN-PLACE METHOD OF INSTALLING CONCRETE LININGS.

How to Combat Internal Corrosion

Here is what is being done to reduce the toll of this phase of corrosion on pipe line operations.

By RUSSELL A. BRANNON, Humble Pipe Line Company, Houston

UNUSUAL DIFFICULTIES are the rule in each internal corrosion problem encountered by pipe lines. Causes, extent of occurrence, cost of losses attributable to internal corrosion, and methods of control or prevention are often different for crude pipe lines, crude tanks, or products pipe lines, or natural gas lines.

Crude pipe lines. Difficulties caused by internal corrosion in crude lines may vary widely. It is caused by brine and other dispersed materials settling onto the pipe surfaces. Damage is usually negligible except in cases where the oil contains hydrogen sulfide. These so-called "sour" crude oils vary in corrosiveness depending upon the concentration of hydrogen sulfide, the amount of brine and other matter which settles from the oil and upon operating conditions. Corrosion is most severe where oil flow is slow or intermittent. It usually occurs on the bottom of the pipe and may take the form of isolated pits, general thinning of lower portions of the pipe or formation of continuous grooves along the bottom. The corrosion rate is greatly accelerated when solid particles of iron sulfide scale are permitted to settle with the brine. On the other hand, pipe lines which are operated with continuous turbulent oil flow are not likely to be affected by internal corrosion. For this reason, most trunk lines do not experience serious internal corrosion. Gathering lines in fields where sour crude oils are produced are often seriously affected.

Most North American sour crude is produced in West Texas, although there are some sour oil fields in the Texas Gulf Coast, Arkansas, Wyoming and Canada. Internal corrosion is likely to occur also in station lines wherever sour crude is handled. These lines frequently are large in diameter with the result that oil flows through them at low rates permitting brine settling. They frequently are idle for considerable periods of time, speeding up corrosion. The amount of such pipe subject to corrosion is not great but its unit cost is high, which makes corrosion a problem of real economic importance. Because sour crude is shipped by pipe lines, tanker, and

PRESSURE TEST of perforated concrete cement-lined pipe. Various sized holes were cut in 8-inch pipe which was then lined. Lining at a 2-inch hole failed at 900 pounds per square inch internal pressure.

barge to many parts of the world, the problem is widespread geographically.

Various attempts have been made to determine the cost to the pipe line industry of internal corrosion. This has been a difficult problem because of the varying rates at which it occurs. Cost of damage is difficult to assess as it consists of destruction of pipe, cost of repairs, losses of oil, property damages, loss of operating time, and loss of good will with the public. Corrosion cost surveys are further complicated because oil leaks from internal corrosion result in an increased external corrosion rate. Many soils that are normally non-corrosive even to bare pipe buried in them become extremely corrosive when contaminated with sour crude oil.

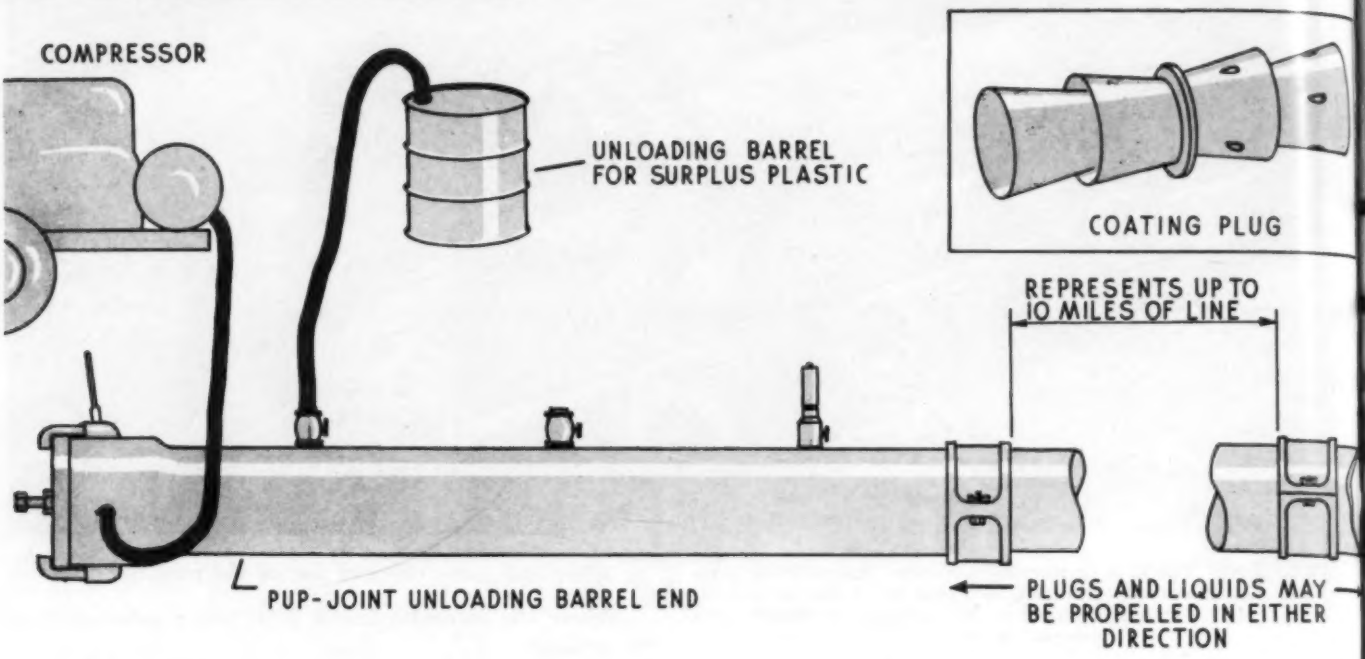
Design lines against corrosion. There are several means which may be employed to control or reduce internal corrosion. Benefit can sometimes be obtained by simple and inexpensive modifications of construction practices and operating procedures. If oils are only moderately corrosive, the following changes may provide satisfactory corrosion control:

1. In pipe joined by threaded collars, failure usually occurs first in the pipe threads. Welded pipe sometimes is superior to screwed pipe.
2. Construction practices which avoid the formation of pockets or sags in the line will reduce corrosion by minimizing brine settling. One good solution is to construct the lines on uniform grades so that the brine will collect in a few points where it may be drained off.
3. It may be possible in some cases to construct the system of small size pipe so that the oil will flow at high rates for a large proportion of the time. The pipe in such a system would corrode less than that in a gravity system with low rates of flow or one in which daily runs are completed within a few hours. Such a system might also have advantages of lower construction costs and more efficient use of the facilities.

Where the corrosion rate is high, other measures may be needed:

1. Materials not attacked by sour crude can be used in place of steel for piping. Asbestos cement pipe and plastic pipe have been placed in service. These materials resist the corrosive action of the oil, but their brittleness and low strength have limited their use for crude pipe lines.
2. Cement lined steel pipe has given excellent service in preventing corrosion. It has not been widely used, however, because the lining was thought to be brittle and easily damaged during construction. Some engineers felt that satisfactory joints in the lining would

WELDED CONCRETE-LINED PIPE. Welding pulls ends of liners tightly together without damage. (Two-layer appearance of pipe results from grinding sharp edges of hacksaw cut.)


COMPRESSOR
UNLOADING BARREL FOR SURPLUS PLASTIC
COATING PLUG
REPRESENTS UP TO 10 MILES OF LINE
PUP-JOINT UNLOADING BARREL END
PLUGS AND LIQUIDS MAY BE PROPELLED IN EITHER DIRECTION

be difficult to obtain and that the comparatively thick lining would reduce capacity of the lines. Recent studies have shown, however, that elaborate or costly handling is not necessary and that satisfactory joints can usually be obtained in the lining without special treatment. Where joints require extra finishing sodium silicate solution can be pumped through the pipe after construction to seal joints or cracks.

Lining of pipe lines with concrete in place has been practiced in the water industry for a long time but the rates at which the linings can be installed are slow and the method has not been widely used in the pipe line industry. Improved equipment and methods are being developed and it may be that this very effective lining can be more widely used. In place application has a great cost advantage because badly corroded pipe need not be repaired or replaced. Experience has shown that linings will plug most holes and the pressure testing has proved that linings will hold high pressures at pipe perforations.

3. Another method of reducing internal corrosion effects is to dig up pipe lines after they have corroded thin on the bottom and rotate the pipe so that the thicker portions are on the bottom. Operations require ditching, welding, and back-filling of lines and are quite expensive. For this reason methods which can be carried out with pipe lines in place are favored.

Plastic coatings gain acceptance. Application of plastic-type protective coatings to the inside of pipe lines in place reduces maintenance costs. Progress in the techniques of applying such coatings has been rapid in recent years. Many have cooperated in these developments; contractors specializing in this type of work, pipe line companies willing to try these new methods, and coating manufacturers who formulate materials with the special properties needed.

Thorough cleaning of the line is the first step in coating. Scrapers and brushes remove most oil, water, and scale from the pipe walls. Solvents and chemical cleaners may also be used to clean the pipe. Cleaning can be surprisingly thorough because these corrosion products are generally non-adherent.

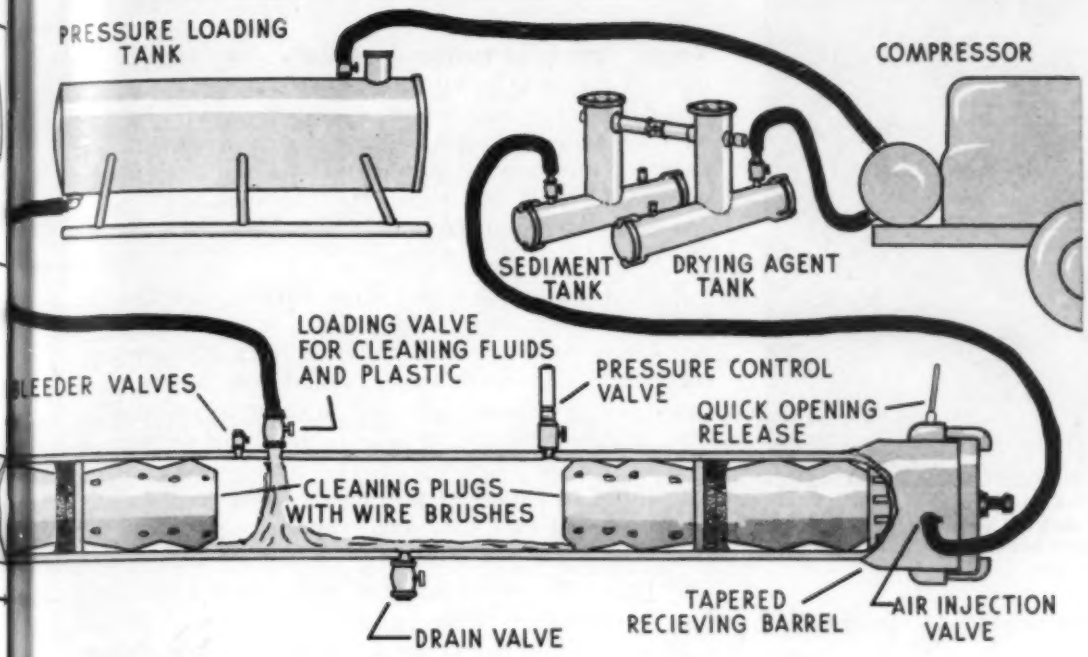
They are readily removed by mechanical means and by solution of any paraffin or other hydrocarbon materials present. Normally the last cleaning operation consists of forcing a batch of volatile solvent through the line. Traces of solvent are then evaporated by blowing air through the pipe.

Plastic type coatings are applied by forcing batches of paint ahead of specially designed plugs propelled by cleaned and dried compressed air. In some processes back pressure is maintained ahead of the batches of coating. One or more coats may be applied, depending upon the property of the coating material and the thickness desired.

This method was first used in 1946 and an estimated 400 miles of pipe lines have since been coated internally. Coating materials vary in type. A great deal of vinyl type coating has been used, as well as phenolic compounds of the catalytic setting type. There is currently a great deal of interest in coatings of epoxy resins which are amine cured materials.

Solvent washing a problem. Several problems are encountered in coating lines internally in place. One is the removal of solvents from coating films after they are applied. Solvents evaporated from one portion of the pipe line are carried along toward the exit, with the result that drying air frequently becomes saturated and condensation of solvent then occurs. Condensed solvent then re-dissolves the applied coating causing it to run to the bottom of the pipe or to low spots in the line. Research toward reducing the amount of solvent in the material should reduce this danger of solvent washing.

Materials are being developed with higher solids content, thixotropic properties and carefully controlled viscosity to reduce the tendency of coating films to flow after application. Amine cured materials such as the epoxy resins and vinyl coatings have good viscosity



Typical arrangement for in-place plastic coating of pipe lines

characteristics for coating pipe lines internally. While coatings applied internally in place have not been perfect, they do have a good performance record. Many pipe lines with histories of many failures, were repaired and after coating have experienced few if any leaks. Better materials and improved techniques now available should give even better performance.

Early internal coating jobs were limited to sections of less than two miles. With improved application techniques and plugs, coating contractors claim that sections of ten miles or greater length can be cleaned and coated in one continuous operation.

Inhibitors afford protection. Chemical inhibitors added to the crude oil streams also reduce corrosion. These inhibitors may be added continuously or injected in batches at intervals of one day to two weeks. Use of inhibitors has a disadvantage of a continued operating cost. Since many lines needing protection are short ones and handle only small volumes of oil, continuing costs cannot be tolerated. The method has its widest application in comparatively long lines handling large quantities of oil where it is convenient for station operating personnel to inject the inhibitors.

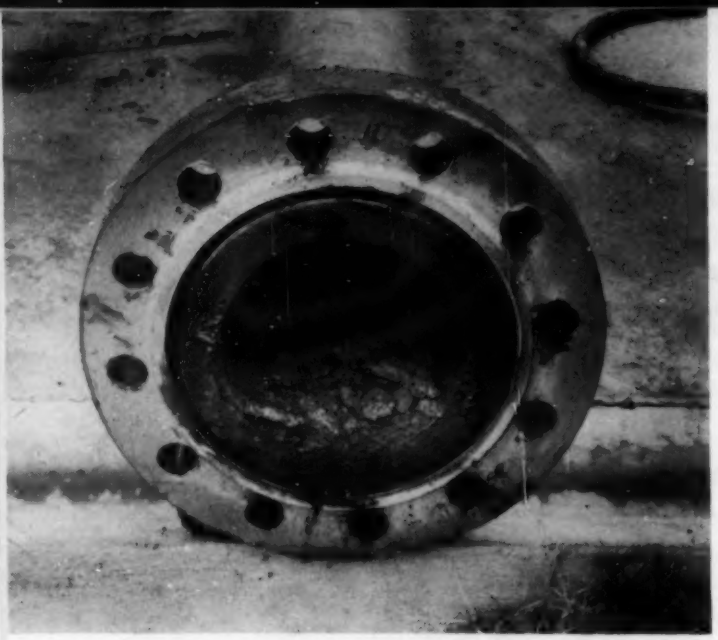
Inhibitors most used are organic semipolar compounds. They may be oil soluble, water soluble, or oil-water dispersable. Their effectiveness apparently depends on a tendency to be deposited on the iron surfaces in such a manner as to provide continuous protective films. These films, in effect, form protective coatings which prevent contact between steel and water. Periodic scraping of lines to remove large water deposits, solid iron sulfide scale and other sediment improves the performance of these inhibitors. In addition to organic inhibitors some inorganic ones, such as zinc injected as a zinc dust-oil slurry, are reported to be effective.

Protection against corrosion solves other problems. Corrosion problems are often related to others in the pipe line industry. For instance, protective coatings inside of pipe lines also often prevent paraffin and other materials from depositing out of oil and sticking to the coated surfaces as they do bare steel pipe. Lines have been coated on the inside primarily to reduce this deposition and have reduced the cost of removing paraffin deposits by steaming or by scrapers. Inhibitors too may also have other beneficial effects by reducing the amount of foreign material deposited on the pipe walls. Corrective measures are often beneficial in more than one way.

Control proves economical. The present cost of cleaning existing pipe lines and applying protective coatings to them in place is about 20 percent of the cost of constructing new lines. Cement linings cost more but should last longer. While several crude pipe lines have been protected internally by means of inhibitors, little cost data are available. Standard procedures have not been adopted for the control of internal corrosion because they have not been fully developed. Each case requires special study for selection of the most economical means of controlling the corrosion. Unless corrosion is exceptionally mild it is cheaper to cure than to endure it.

Coatings save tanks. Internal corrosion of crude tanks has been of major concern to pipe line companies. This problem is more widespread than internal corrosion of pipe lines because sour crude is handled over a much greater area.

Two types of internal corrosion occur in crude oil storage tanks. In one case, tank bottoms are corroded by brine settling out of the oil. This may occur with any type of oil, but is most pronounced with sour crude oil containing hydrogen sulfide. Hydrogen sulfide brines attack steel directly and the rates are faster when solid particles of iron sulfide fall from the roofs onto the steel bottoms. Iron sulfide may also be carried into tanks in the oil streams. Electrolytic cells are set up between the solid iron sulfide particles and steel which result in rapid penetration of the steel tank bottoms and walls. Corrosion of this type is combatted by applying coal tar base enamel coatings to the tank floors, and lower portions of



CORROSION SCALE in a petroleum products line. This deposit was near an orifice plate and was not representative of the whole line.

tank shells and roof supporting columns to a height of 15 to 30 inches.

Many tanks were formerly protected by means of asphalt base coatings. These coatings required that a layer of water be maintained on top of them to prevent their contact with the oil. Protection was not afforded to the shell because the coating readily dissolved in oil. Corrosion of the shell was frequently most severe at the oil-water line. Coal tar base coatings which resist the solvent action of oil are now widely used.

Improved procedures are now being employed for applying coal tar enamels. Metal surfaces are usually prepared by sandblasting to insure that all foreign matter is removed and that the steel is really clean. Enamel temperatures are carefully controlled during melting and application. After application the finished coating should be inspected closely by means of a spark-type holiday detector, and all imperfections carefully repaired. Perfect application is demanded because of the high cost involved in making inspections or repairs to faulty coatings after the tanks are put in service.

Several producers of coal tar base coatings manufacture materials especially designed for tank bottom use. The material must be tough and flexible even at low atmospheric temperatures to prevent cracking from temperature changes and from flexing of the tank bottom. Oil may be placed directly on these coatings as they are only slightly oil soluble.

Tank bottoms repaired with concrete. When it becomes necessary to replace steel tank bottoms for any reason, it is common practice to install concrete bottoms in their place. A 6-inch thick slab of reinforced concrete is poured on top of the old bottom. At the edge of the slabs thickness is increased to 12 inches and expansion joints are provided between the concrete slabs and the tank shells. These V-shaped expansion joints are sealed by means of packed oakum and coal tar mastic. The cost of a concrete bottom replacement is less than for a new steel one, and experience has shown that they are quite satisfactory. A recent survey of the pipe line industry shows that concrete bottoms are being poured at the rate of about 100 per year.

HOW TO COMBAT INTERNAL CORROSION

Vapor space corrosion is tough. Another type of internal corrosion in crude oil tanks takes place in the vapor zones. It occurs almost exclusively in tanks holding oil containing hydrogen sulfide. Corrosion occurs as a result of condensation of moisture on the steel in the presence of hydrogen sulfide and hydrocarbon vapors. Attack can be quite rapid and holes have developed in roof decks in less than one year.

Rate of vapor zone attack is not directly related to the hydrogen sulfide concentration. Small amounts of hydrogen sulfide may cause high corrosion rates. Moisture can condense inside tanks under almost any atmospheric conditions in amounts sufficient to cause corrosion. The most effective way now known to control this corrosion is to eliminate the vapor spaces. This may be virtually accomplished by means of floating roofs that rest directly on the oil and have only small vapor spaces around the rims. While the cost of these roofs is much higher than cone type roofs, additional benefits are gained by reduction of evaporation losses.

Many types of protective coatings have been used in the vapor spaces of tanks but their high application costs and comparatively short service lives have kept them from being widely used in the pipe line industry. Improvements in application methods and quality of plastic type coating materials now give promise of providing satisfactory coatings for this service. Small tanks can be adequately protected and it is claimed that large tanks can also be protected at reasonable costs so that they will be given extended service lives.

Sprayed cement linings in tank vapor spaces give good corrosion protection. The lining is applied at a thickness of about ¾ inch to the tank deck and to cover the roof supporting structure and tank shell downward for a distance of at lease five feet. While protection is good, the cost of this treatment is relatively high and the cement cannot be salvaged if the tank should need to be moved.

Vertical surfaces of the tank shell and roof supporting columns are usually not seriously attacked by internal corrosion, provided they are periodically wet with oil. It appears that oil films on these surfaces cause condensed water to form into drops and fall into the oil.

Products lines. Problems raised by internal corrosion of products pipe lines are unique in many ways. All pipe lines need some sort of protection or control measures, since corrosion occurs to some degree in all of them. Here damage to pipe by corrosion is of relatively minor importance. Corrosion prevention is important because the products of corrosion contaminate those oil products being carried. Accumulation of corrosion products on the pipe walls also reduces the carrying capacity of the pipe lines.

Corrosion occurs as a result of water being deposited on the pipe wall from the product. Water is slightly soluble in petroleum products in direct proportion to temperatures. Most products are water saturated when received by pipe line carriers as a result of refinery operations. Lowering the product temperature in transit results

in water coming out of solution. These finely divided droplets of water become attached to all surfaces of the pipe wall, top as well as bottom. Sometimes finely divided rust is swept along with the product stream, causing trouble in meters, filters and pumps. Scale may adhere instead to the walls of the pipe, increasing its roughness and reducing flow capacity of the lines.

One control measure for this type of corrosion is to remove water from the products to the point where it will not precipitate at pipe line temperatures. This method is used to some extent but has the disadvantage of requiring expensive dehydration equipment. Operating expenses are also quite high unless they can be integrated with refining operations.

Inhibitors protect products lines. The best means of controlling internal corrosion of products lines is by the use of inhibitors. Two general types of inhibitors are used; oil soluble, and water soluble. It is natural to expect that water soluble inhibitors would be the most economical and effective since water is the corroding medium and it is present in extremely small proportions. It seems however, that the oil soluble inhibitors are attracted to steel surfaces not already covered with inhibitor film, and are readily deposited out of solution. As the amount of steel to be protected is the same in both cases, it is debatable as to which type is better.

Inhibitors are injected into the pipe lines at pumping stations in amounts proportional to the product flow. Amounts may vary with the type of inhibitor used and with company practices. As a rule, only a few pounds are used for each one thousand barrels of product.

While the problems of internal corrosion are universal among operators of product pipe lines, methods of controlling it effectively and economically are available and are being used with satisfactory results.

Gas pipe lines. Cause of corrosion of gas pipe lines stems most frequently from moisture condensation. In the case of transmission lines, internal corrosion is a minor problem, because most of the gas supply is sufficiently dry to prevent moisture condensation. In gas gathering systems, however, it is sometimes necessary to transport gas which has not been dehydrated. In those cases where the gas also contains hydrogen sulfide, the corrosion problem is aggravated.

Corrosion by condensation from sweet gas results in the formation of iron oxide that remains attached to pipe walls increasing their roughness and reducing the rate of gas flow.

Solid rust particles carried in the gas stream may also cause trouble in gas meters and gas regulating equipment. The usual means of controlling this type of corrosion is by dehydration of the gas and providing drips or other facilities for removing any water which may be accidentally carried along in the gas stream. Where corrosion occurs in the presence of hydrogen sulfide, serious results do sometimes arise. Cases of hydrogen embrittlement of the steel or formation of hydrogen blisters have resulted in pipe failure from internal pressure. This type of corrosion may be controlled by adding organic inhibitors to the gas stream as it enters the pipe line in some cases.

CORRODED TANK ROOF. Parts of this tank roof support structure had been in West Texas sour crude service 15 years and parts had been in service 5 years. The one-quarter inch thick roof plates were corroded away about one-half in five years.

In any case of internal corrosion of pipe line facilities, one agent is always present. *That is water.* In some cases the water is almost pure in so far as mineral content is concerned. This is true in the case of moisture condensed inside of crude tanks, and that condensed out of natural gas in pipe lines. The water deposits found in products pipe lines are also comparatively low in mineral content. In crude lines and crude tank bottoms the water usually has a high mineral content, and is commonly referred to as brine.

Effective internal corrosion control efforts should be directed toward reducing the amount of water introduced into the systems, or permitted to separate from the contents. Protective coatings need to resist the penetrating action of water, and must also resist the deteriorating effects of oil and gas. Inhibitor films deposited on steel need to be sufficiently stable to resist the solvent action of water. Many years ago a doctor said that if a person kept his head cool and his feet dry, he would not need a doctor. It is certain that if operators of pipe lines can keep the steel inside of their tanks and pipe lines dry, or protected by coatings or inhibitor films, they need not pay for internal corrosion.

Comparison of Costs of Uncontrolled Corrosion and of Control Measures Where Internal Corrosion Is Severe

METHOD USED	Control Costs (Cents/Ft./Yr.)
No Control. Costs for a 6" line 30 miles long in West Texas during a 10 year period— including cost of leak repairs and reconditioning and value of oil lost.	24
Concrete Linings. Cost of lining is 60¢ to 90¢ per ft. for 6" pipe. Annual cost based on 20 year life, but longer life expected.	3 to 4½
Plastic Coating. Cost of coating 6" pipe is about 60¢ per ft., including contract cost and incidental expense. Annual cost based on 10 year life.	6
Inhibitor Treatment. Cost based on 30 miles of 6" line during a 14-month period. Unit cost for shorter line would be higher. Treatment appeared to be effective, but exact degree of protection not determined.	1½

—The End

Start Corrosion Protection Before the Pipe Line Is Laid

It will save money to have the corrosion engineer on the job when the line is still in the planning stage.

By O. W. WADE, Transcontinental Pipe Line Corporation, Houston

FEW COMPANIES hesitate to spend vast sums for corrosion protection. They coat the lines and install cathodic protection systems as a matter of course. To fail to do so would be folly, since the earth surrounding the millions of dollars worth of buried line wages a ceaseless battle to reduce the steel pipe to its original state of iron oxides.

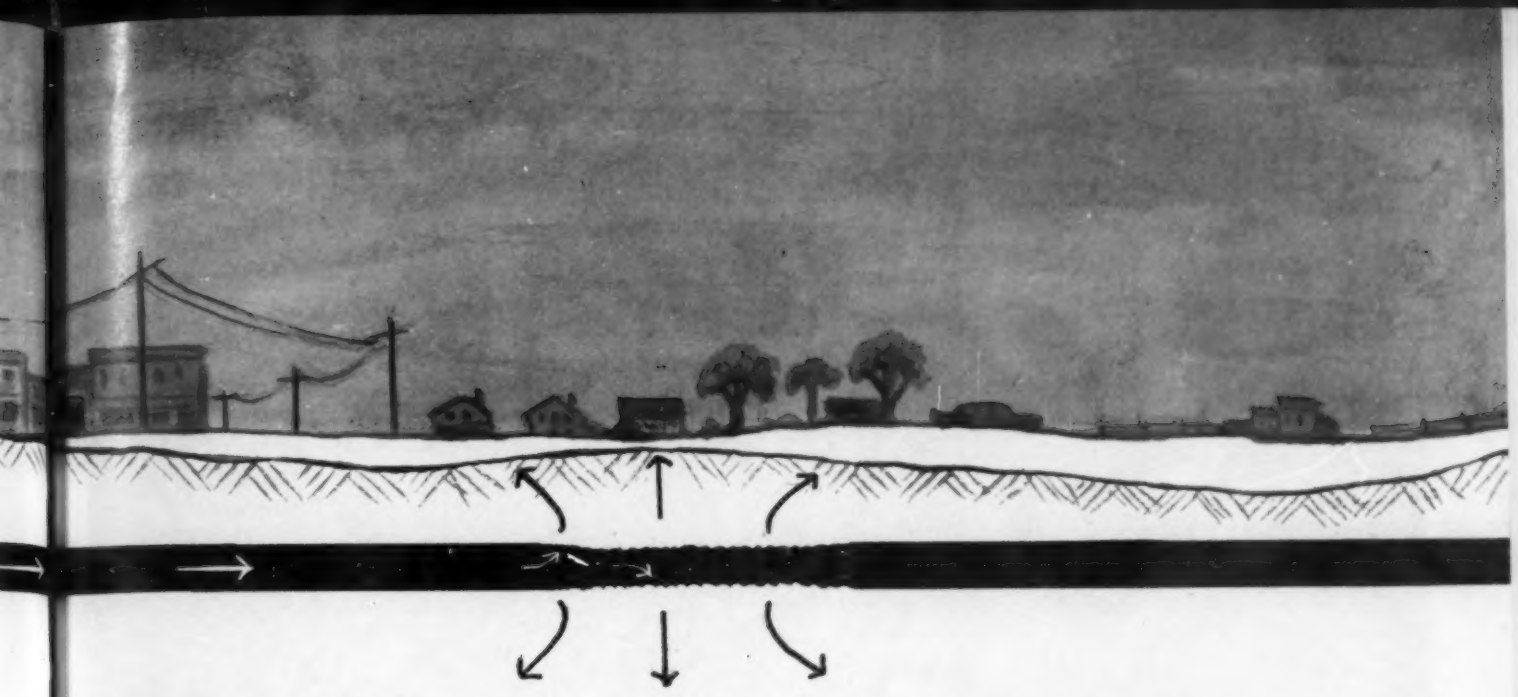
Yet despite the cost and high stakes involved in line protection many companies in the past have devoted little or no engineering and planning to this phase of pipe line design. They simply specify one thickness and type of coating for the line from one end to the other and after the line is complete and backfilled, they call on the corrosion engineer to figure out a cathodic protection system.

Fortunately, such practices are on the wane, and progressive companies are calling the corrosion engineer in while the line is in the design stage. In order to realize the greatest return on dollars spent on corrosion control, the corrosion engineer should make a visual survey and study of conditions that will contribute to future corrosion problems along the right-of-way.

From this study, the corrosion engineer can determine the type of coating necessary for the various conditions that may be encountered, the most effective use of insulating flanges by proper location and the most convenient location of test leads to expedite future work.

Consider why these factors are important and must be given serious consideration with the initial design of the pipe line: First, why isn't one type of coating sufficient for all localities? The primary consideration is one of economics. The two extremes from the standpoint of cost may be a comparison of a thin asphalt enamel with glass innerwrap and a thick asphalt mastic coating plus a heavy outer coating of reinforced concrete. The initial cost of the heavier type of coating may be ten times that of the thinner one. However, because of the problems encountered in construction and the location of the right-of-way, the use of the cheaper coating could be an extreme case of false economy.

For example, if a pipe line is constructed in a densely-populated area underneath a paved street where there are innumerable crossings of other underground struc-



HERE IS AN INSTANCE WHERE HEAVY COATING IS NEEDED, even though existing lines show no evidence of corrosion. But the heavy stray currents that flow toward the pipe in this cathode area intensify corrosion where they leave down the line.

tures, a premium coating is mandatory. Heavy asphalt mastic coating plus a reinforced concrete coating would not only afford the best possible resistance to corrosion but would also afford good protection against any future exposure to mechanical damage that might result from the construction of other underground facilities. It is obvious that a less expensive type of pipe line coating would be adequate for those areas in open country and where the corrosiveness of the soil is at a minimum.

In any locality, the number of underground structures which must be considered either during construction or later with the design of cathodic protection facilities, make the proper selection of the coating highly important. In order to stress the importance of these considerations, the circumstances of a similar problem will be explained.

The case of the non-corroding line in 'pipe line alley' . . .

The right-of-way of a proposed line was located in a suburban area referred to by some as "pipe line alley." An engineer, not experienced in the problems of corrosion control, inspected the conditions along the right-of-way for the purpose of recommending a type of pipe line coating for the particular area. During his investigation he observed some work being done on an existing pipe line in the area. Despite the fact that the coating was virtually in tatters, the pipe was in almost perfect condition. There was no evidence of pitting.

Without further consideration, he assumed that the conditions in this area offered no particular problem for corrosion control, and he recommended that the proposed pipe line through this area be coated with a 3/32-inch coal tar enamel and glass inner-wrap coating.

But before construction started, an experienced corrosion engineer was called in to make a similar survey. He learned that the reconditioning of the coating on the existing pipe line was being done because of the stray current problem which had arisen in the area. The section of line which had been inspected by the previous engineer was in a location where the pipe was acting as a cathode, picking up large quantities of current. This current was being discharged to earth several miles away. Thus, the corrosion which was caused by the faulty coating was some miles distant.

As a result the experienced corrosion engineer recommended that the coating specifications be changed to an asphalt mastic coating to obtain maximum resistance between pipe and earth in the area subject to heavy stray currents.

However, at the time this change in specifications was requested, construction preparations had progressed to the point where coating contracts and construction contracts had been let. The cost for the proposed change would have increased the cost for construction and coating about $50,000. Because of this increase, the change in specifications was not made.

During the first three years after this line was put in operation, $22,000 was spent for corrosion engineering, labor and materials. In the fourth year the conditions were changed completely by the discontinuation of a DC-powered electrical railroad which was being utilized by every pipe line in the area as a source of current for cathodic protection. This change in conditions made it necessary to start anew with a different approach.

Engineers estimate that an additional $20,000 will be required to design and construct new corrosion control facilities. If the change in specifications for the coating of this line had been made as recommended, variations in changing conditions in this area would have had a minimum effect. The money spent very nearly approached the difference in costs which were originally considered. The time which was spent in solving the problems on this line could have been used elsewhere. Had the initial specifications for the coating of this line been correct, approximately $40,000 and 8000 man hours could have been saved.

LINES LAID IN METROPOLITAN AREAS such as this should be broken up electrically with insulating flanges. This enables the corrosion engineer to meet changing conditions such as new lines, discontinuation of electric railways and suburban areas growth.

Advantages of planned electrical insulation . . .

The advantages that can be realized from the best coating obtaintable can be reduced by other considerations. For the transmission line, the terminus is the tank farm or the distributor. For the distributor, it is the consumer, factory, home or plant. Each of the latter is in contact with other underground structures.

From the standpoint of corrosion control it is necessary that that portion of each pipe line which is considered for a corrosion control program be isolated electrically from any structure which may be, or may become, an integral part of another underground structure.

The purpose of the coating is to reduce the amount of

metal surface in contact with the earth which will require cathodic protection. Electrical contact with other underground structures increases the quantity of current necessary to provide cathodic protection in direct proportion to the bare metal surface areas involved.

The solution is to use insulating couplings. The type of coupling employed is dependent upon the type of service it must perform as related to size, pressure and material. Primary consideration to the location of insulating couplings are as follows:

Transmission Lines

1. Between producing well and gathering lines.
2. Between suppliers' line and gathering line.
3. Between gathering line and main transmission line.
4. On each side of all meter stations, compressor stations, pumping stations, regulating stations and any building which at present or may later require electrical power for the operation of the facilities it houses that are in contact with the pipe line.

Distribution Lines

1. At point of delivery, meter station or terminus of transmission line.
2. Each side of regulating station.
3. Between meter and line to customer.

Other locations that should be considered, but are of a secondary nature, are: underground river crossings, bridged river crossings, congested metropolitan areas and any area which might represent an excessively corrosive environment or condition.

If due consideration is not given to the proper location of insulating joints in the design stage of the pipe line, it may not be practical or economical to consider their installation after the line has been put in service. If insulating flanges are not installed on transmission lines during construction, a temporary shutdown of the entire system may be required to install them.

If insulating joints are not used to electrically isolate a pipe line, nearby grounding cables, grounding rods, water lines and the grounded neutral of the electrical power service to the station become an integral part of the main line. This may make it impossible or infeasible to supply sufficient current to protect the main line in the vicinity of the compressor station.

A specific example will illustrate the need for insulating flanges on each side of any building which may house metering, regulating or other equipment necessary for the operation of the pipe line.

In this case a meter station was located on the property of the customer at a gas manufacturing plant. An insulating flange had been installed on the discharge side of the station. At the time these facilities were designed, there was no apparent need for an insulating flange on the inlet side. Electrical power for lighting was not considered necessary. However, after this meter station was placed in service, a decision was made to install lighting. But with the lighting came a serious corrosion control problem. The grounded neutral of the electrical power service to the building made the insulating flange on the discharge side ineffective and the transmission line was metallicaly connected to the customer's gas plant and its underground distribution system.

In order to correct this condition, it was necessary to discontinue temporarily service to customers, 'blow down' a portion of the transmission line, and install an insulating flange on the inlet side of the meter station building.

Quite often, such installations are made without seeking the advice of the corrosion engineer. To the average pipeliner it was not obvious that bringing a lighting system in this building could have any bearing whatsoever upon the corrosion control design.

•

Location of Test Leads . . .

Since the work of the corrosion engineer is one of electrical and electro-chemical analysis, it is necessary that electrical test stations be installed throughout the pipe line system. These test stations are for the sole purpose and use of the corrosion engineer. They perform no other function.

These inexpensive ($25 to $35) test stations should be located so that they will be easily accessible, as nearly as practical, by automobile.

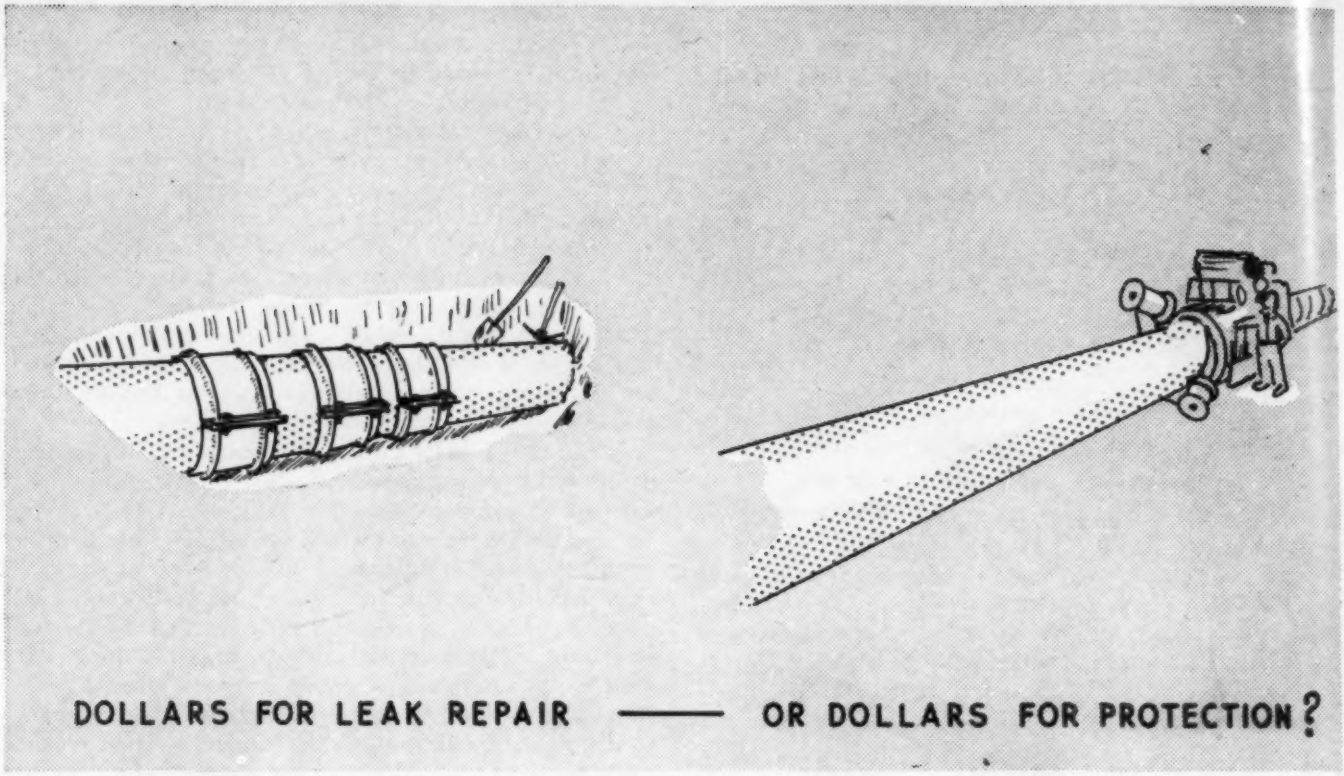
The corrosion engineer should be consulted regarding the specifications for these test stations. He should specify their design, spacing and location. The location of the pipe line may require special attention with respect to design and frequency of the test stations. It has been a common practice in the construction of pipe lines to specify that electrical test stations be installed one mile apart along the pipe line.

It has not been unusual that this be interpreted by the contractor and company inspector that a test station should be installed every 5280 feet regardless of the circumstances that may be encountered by such locations.

Consequently, test stations thus located, are found in the middle of cultivated fields, swamps, lawns and numerous other locations which may be entirely unnecessary and undesirable. Many test stations thus located are worthless as far as their use by the corrosion engineer is concerned. Property owners rightfully object to having these stations located in those areas which may cause them a needless inconvenience.

It is not expected that the design of any plant be perfect in every respect. The above considerations are only a few which are suggested as a means of reducing the future costs for engineering and labor. At the same time they will contribute to a more efficient operation, better public relations and uninterrupted service to the customer for the pipe line that is being designed.

—The End



For the corrosion engineer . . .

Economics Is a Basic Problem

Virtually every decision a corrosion engineer makes calls for another. And all of these decisions have an economic basis.

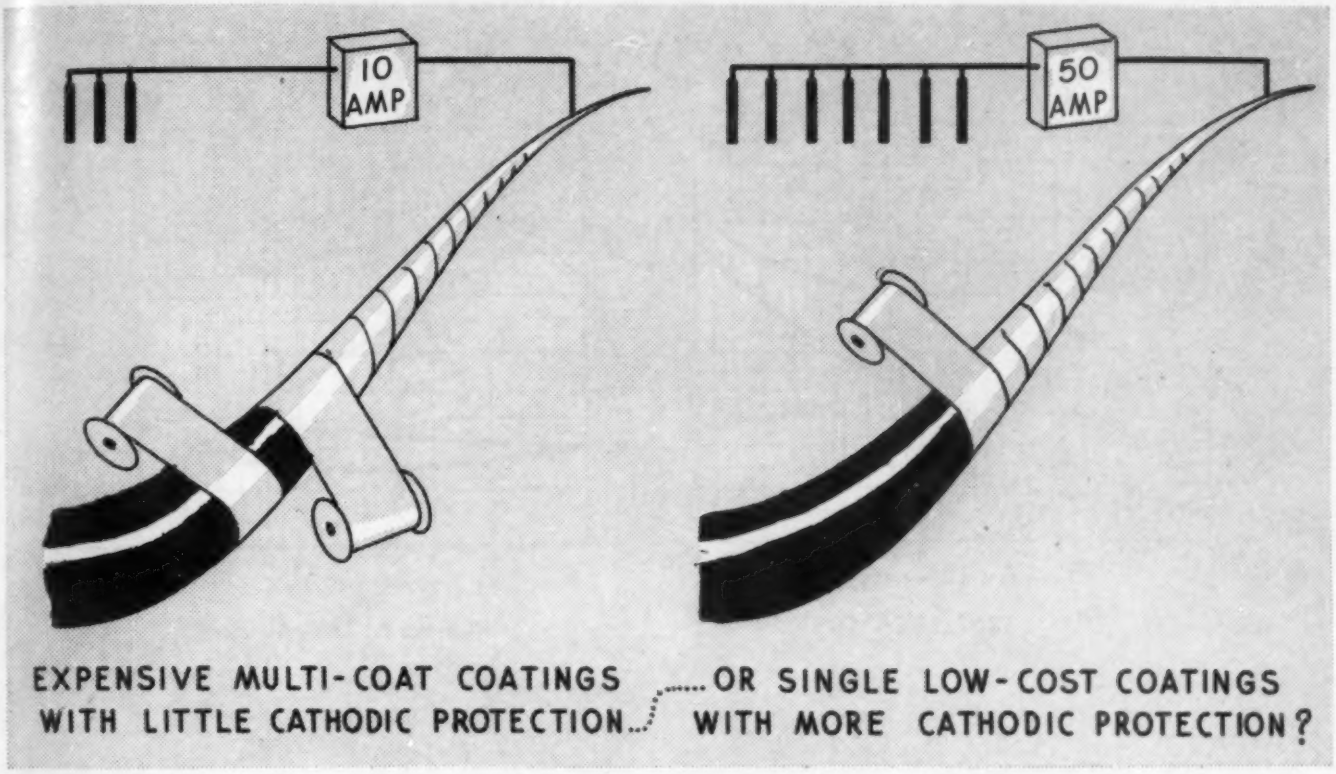
By MARSHALL E. PARKER, Consulting Engineer, Houston

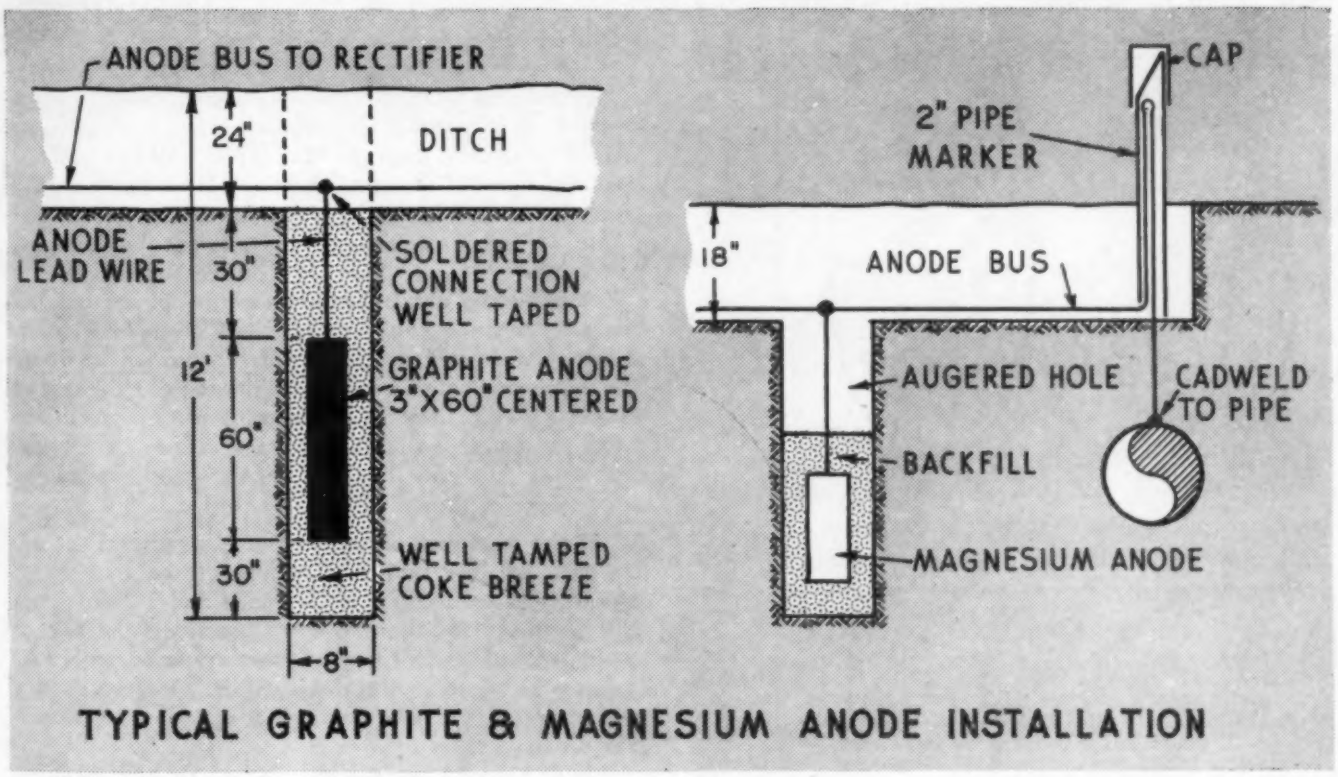
ALL STRUCTURES made of metal are subject to corrosion in some degree. Sooner or later, money will have to be spent because of corrosion. It is the fundamental task of the corrosion engineer to see that the amount spent for corrosion is as small as he can possibly make it. He seeks always to spend dimes at one point to avoid spending dollars at another; to spend dimes for one kind of goods or service to avoid spending dollars for another; and to spend dimes this year to avoid spending dollars later. He can, if he is not careful, spend dollars to save dimes; and sometimes he has to spend 9 dimes to save 1 dollar. But always he tries to make the total spent for corrosion—for the sum of losses plus expenditures for control—as small as possible.

The first decision which must be made is the balancing of the cost of corrosion damage against the cost of control measures. Suppose a line is being damaged to the extent of $1000 per year by corrosion. If the cost of completely arresting this attack is $4000 per year, then clearly this would be an unwise expenditure. But it may be found that spending $200 a year will reduce the damage to $500 a year. This represents a saving of $300. Some other value might be even better; this type of evaluation is always a part of the job.

Making the decision described above is easy and obvious. But where do the figures come from? Both the $200 cost and the $500 saving referred to come from engineering studies made by the engineer, and in making these he has to make more and more of the same kinds of choices.

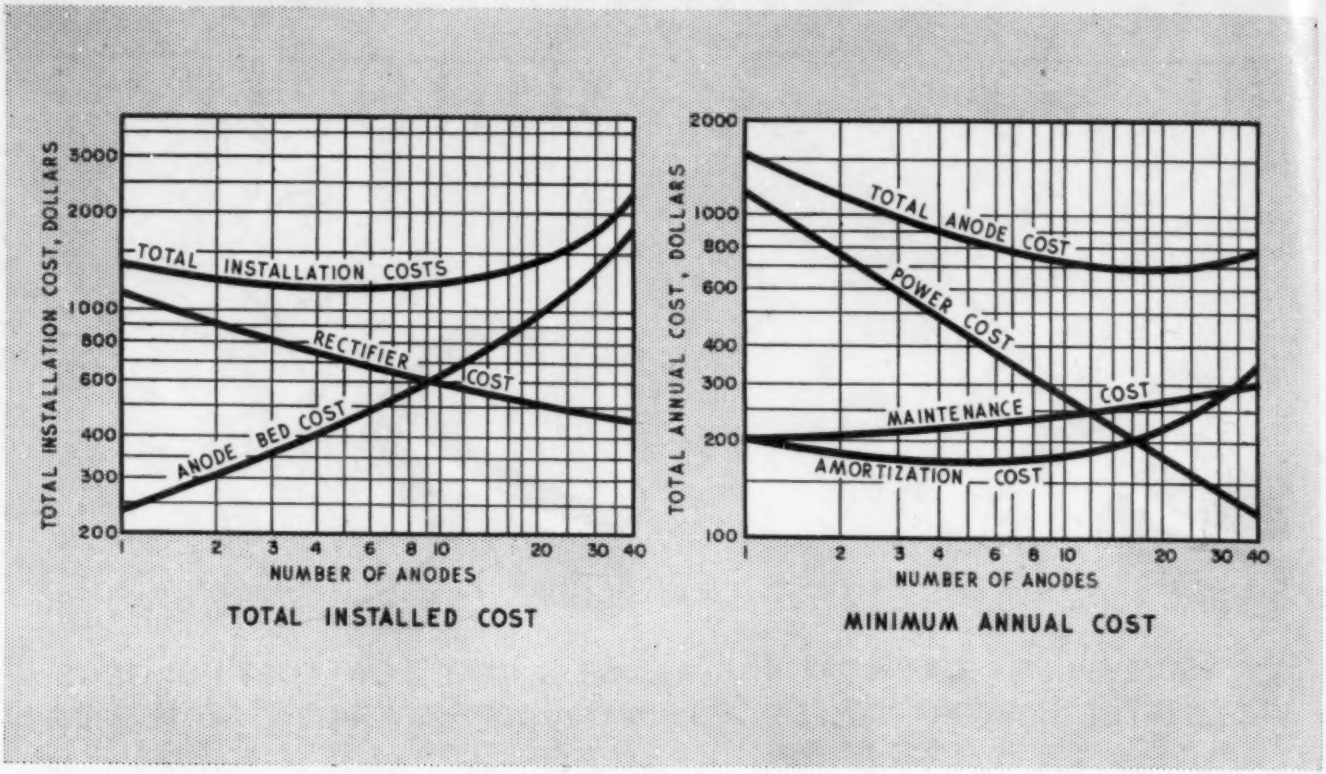
For example, it is well established that in almost all soils, and for almost all pipe lines, the most economical over-all approach to corrosion control is by means of coating plus cathodic protection. But how should the expenditures be divided between these two? *A multilayer expensive coating will require less current for cathodic protection than will a less expensive coating.* But, between any two possible coatings for a specific project, much

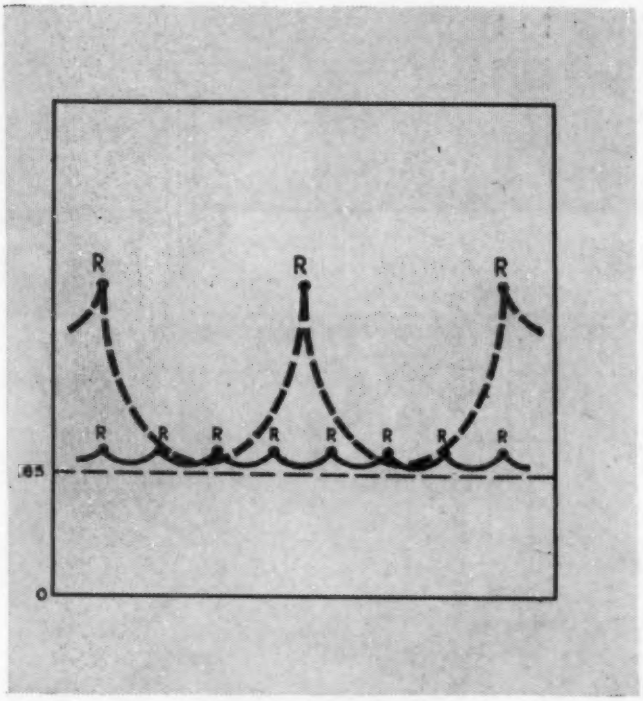

10 AMP
50 AMP
EXPENSIVE MULTI-COAT COATINGS WITH LITTLE CATHODIC PROTECTION...
.....OR SINGLE LOW-COST COATINGS WITH MORE CATHODIC PROTECTION?



study is required to determine whether the savings in cathodic protection are enough to justify the more expensive coating. To this question there is no universal answer. The study must be made for each line.

Almost every decision calls for another. There are many more decisions of the same kind to be made in the design of cathodic protection systems. With the pipe in the ground, there is no room for choice on coatings; the problem is the selection of the economical degree of protection (it may be cheaper to repair leaks) and then the design of the most economical system to supply that degree. Often a choice must be made between galvanic anodes (of zinc or magnesium) and an impressed current system, using rectifiers and inert anodes. For certain values of soil resistivity, galvanic anodes will protect a line





P/S POTENTIAL PROFILE shows less wasted power for many small units than for a few large units.

with considerably less current. But this does not always mean for fewer dollars. Sometimes galvanic anodes are more attractive because the expenditures involved in mitigating interference problems on foreign structures are smaller. This may overcome a higher basic cost for the installation.

When the decision as to type of system has been made —suppose we have decided on rectifiers—there await other choices. Shall we use a few large units or many small ones? The few large units will have to supply more current, but the total cost may be lower. Somewhere there is a balance point, an optimum combination of unit size and spacing. It is up to the engineer to find it.

This is by no means the end. The installation of a single rectifier, at a specific location, to drain a determined amount of current from the line, is also a design problem involving many of the same questions. If we build a small anode bed, it will have a high resistance. This will require a unit of higher rating, and will also involve a higher power bill.

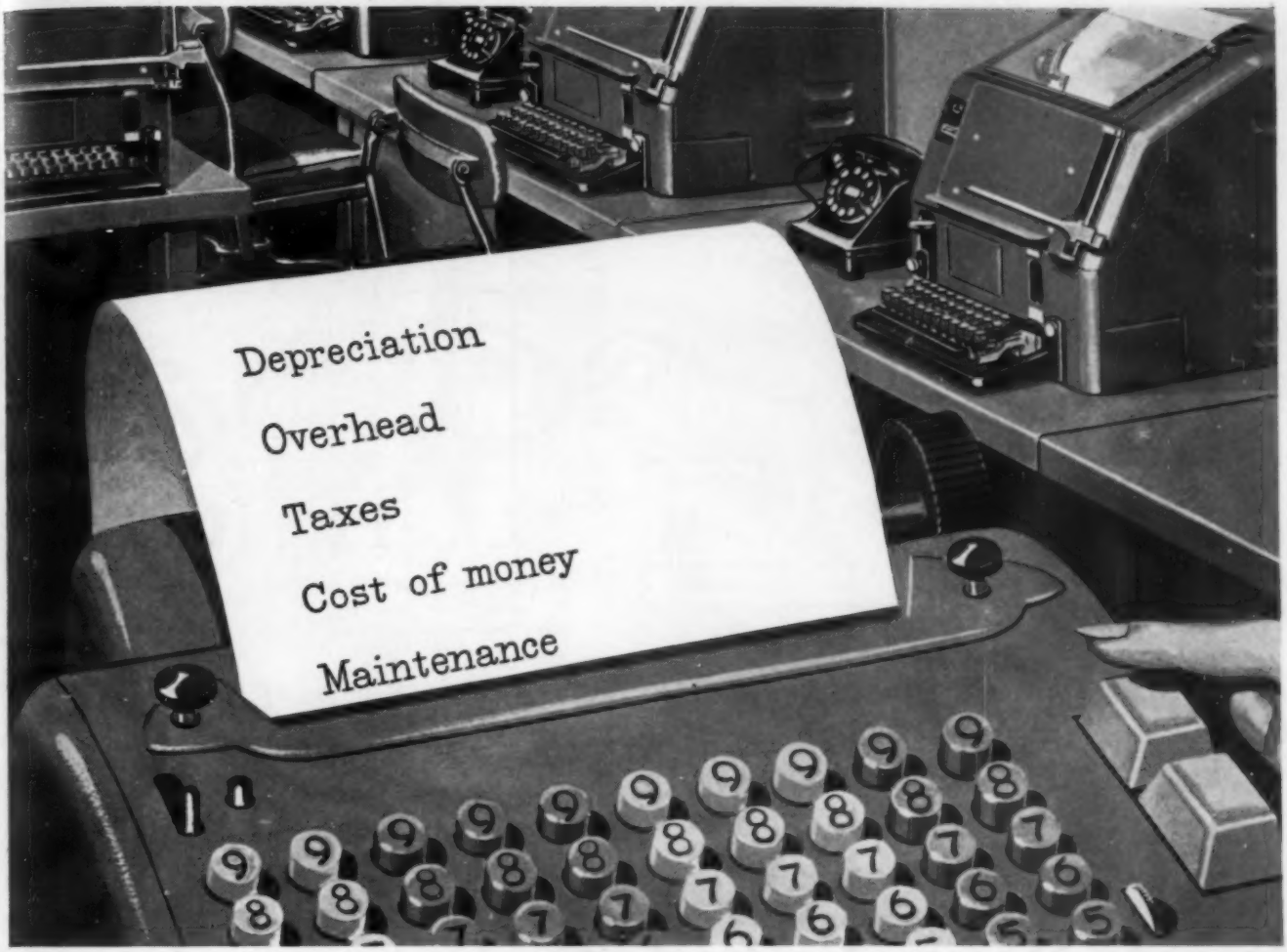
Enlarging the anode bed reduces the power bill but increases the investment cost. For any given location, at this stage of the design, the following factors will be fixed: (1) the amount of current to be drained; (2) the cost of power; (3) the price of rectifiers of the given current rating, as a function of their voltage rating; (4) the resistance of the anode bed, for the known soil resistivity, as a function of the size of the anode bed.

All of the variable costs, both investment and annual, can then be expressed as functions of the number of anodes to be used (for a given anode and a given spacing.) From curves showing these functions, the size of anode bed which will give the lowest over-all annual cost can then be selected. Actually it will be necessary to prepare several sets of such curves if it is desired to investigate different types of anodes.

This technique can even be applied to such detailed problems as that of determining the most economical size connecting cables to use. Large cables have low power losses, but high first cost; the converse is true for small cables. Obviously the answer should be quite different for a unit located in a plant area, where wholesale power rates are in force and for one in as isolated rural location with high power rates.

Where does the process stop? Must the corrosion engineer make exhaustive analyses of comparative costs for

Continued on Page 65



If you provide your own communications system...

HAVE YOU ADDED UP ALL THESE COSTS?

Owning and operating your communications system can be a costly experience, with many costs frequently overlooked. Depreciation, taxes, overhead, maintenance, loss of interest on capital all contribute to your total communication expense.

Bell System communications are low in cost. You pay only a fixed monthly charge for services and facilities tailored to your exact needs. No more, no less. Your capital is not tied up but left free for income-producing investments in *your* business.

The installation of your communications is just the beginning of the Bell System job. Maintenance, replacement, inventory, storage, extension and rearrangement are all handled rapidly and efficiently—no longer problems for you.

Let us show you how Bell System know-how and experience can be put to work to solve your communications problems. For a complete communications study, made without charge, call your local Bell Telephone representative today.

TELEPHONE

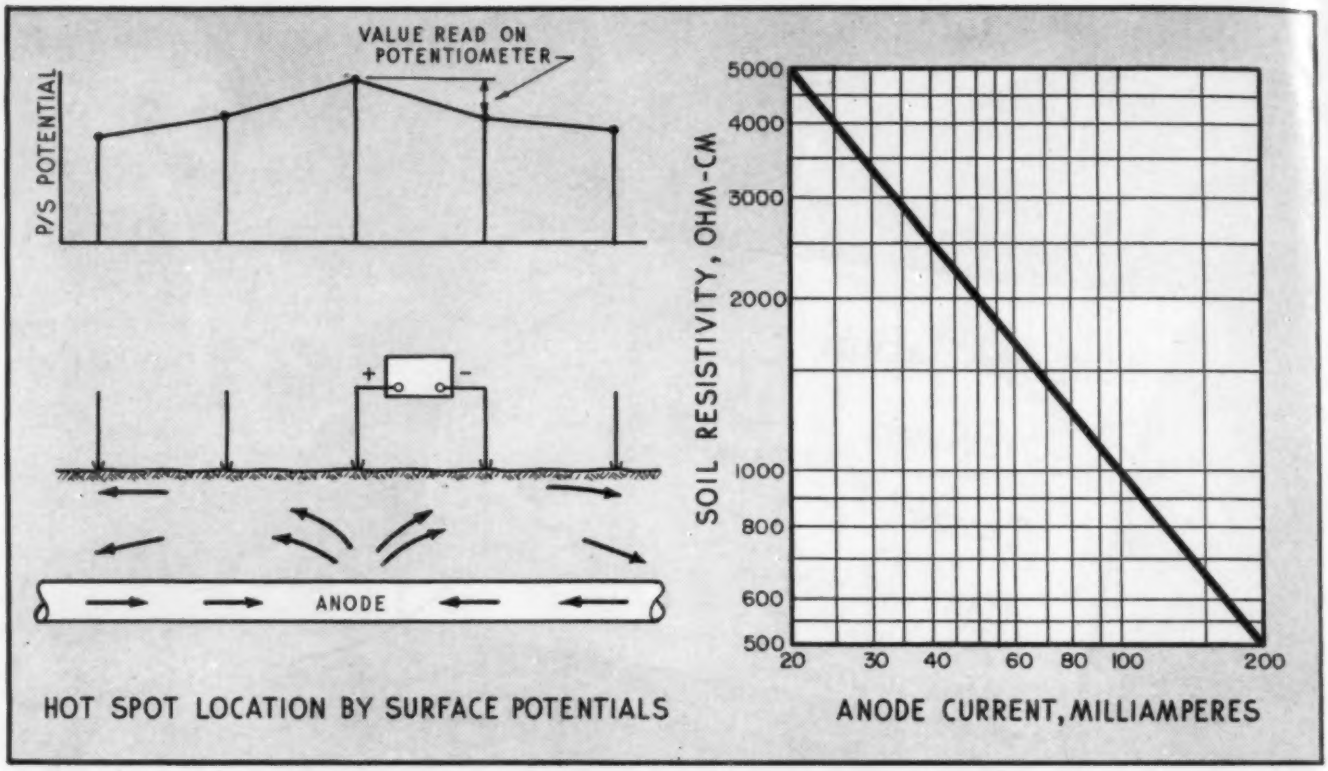
TELETYPEWRITER

MOBILE RADIO

METERING CHANNELS

BELL TELEPHONE SYSTEM

For more data on advertised products, use Readers' Service Cards, last page.



How to Design Cathodic Protection Systems

Here are some actual examples of problems which must be solved in designing a pipe line protection system.

By WAYNE A. JOHNSON, Corrosion Rectifying Company, Houston

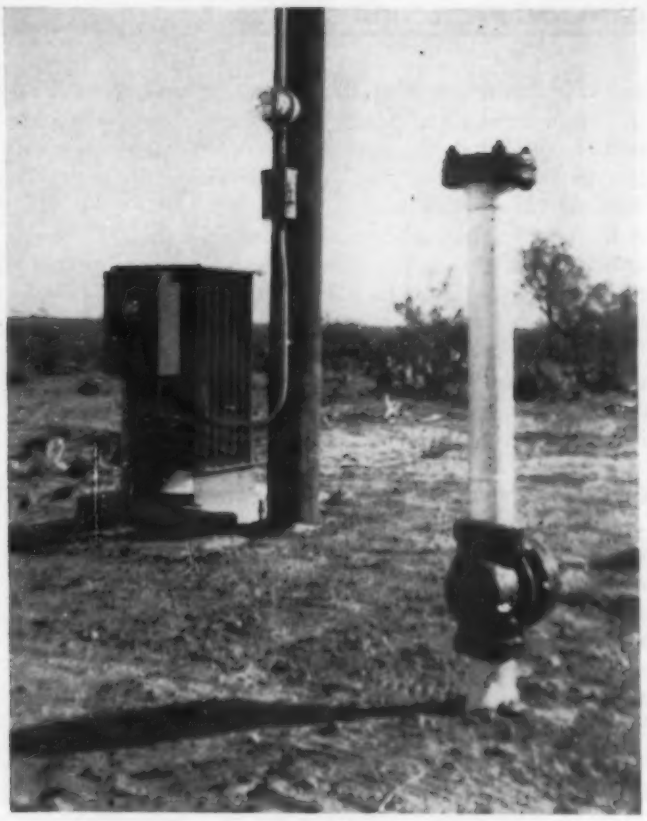
THE FIRST STEP in designing a cathodic protection system is to determine the amount of current which will be required. Rarely can this be done by reference to the known characteristics of the line. An actual field survey is needed. But before any such test can be run, it is necessary to have some idea of the current which will be needed. An intelligent guess is necessary in order to conduct a test. Obviously, if the guess is very nearly correct, the time and effort involved in the test will be a minimum. Bare lines are known to require amperes per mile; coated lines, milliamperes. The engineer must make his preliminary estimate on the basis of his judgment; the better his judgment, the wider his experience, the better will be his estimates, and hence the more accurate his tests.

Types of Corrosion Tests . . .

There are three general purposes for which corrosion tests are conducted on pipe lines.

- To determine the presence, severity, and distribution of corrosion or possible corrosion.
- To determine the amount and kind of cathodic protection which should be installed, and to obtain data for the design of a system.
- To determine and maintain the continued effectiveness of an installed system. These purposes often overlap; and in achieving them, several different kinds of measurements are taken, some of which are as follows.

Air-cooled type rectifier mounted on service pole. Output cables shown at bottom.



Oil-immersed type rectifier protecting a pipe line.

Soil Resistivity. It is known from experience that the resistivity of the soil in which a pipe lies is a good criterion of its corrosiveness. In general, low resistivity soils are highly corrosive, high resistivity soils comparatively mild. There is a gradation of properties between the extremes. The correlation is not perfect or absolute. The relative resistivity of adjacent soils is of considerable importance, so that often a soil which is corrosive along one route is mild on another. Soil resistivity determinations are also made as a necessary basis for the design of anode beds.

Surface Potential Tests. The soil currents accompanying the activity of corrosion along a pipe line cause potential differences in the soil itself. These can be detected by measurements taken at the surface above the line, and by this means the anodic (corroding) and cathodic (protected) areas of a line located. The technique employes a potentiometer or a high-resistance voltmeter, and two reference electrodes (usually copper-copper sulfate). Such a survey can readily be conducted by three men. Often some other data, such as soil resistivity, may be obtained at the same time.

Line Current Test. The basic purpose here is the same as in the preceding test. However, the current in successive sections of the pipe line itself is determined, by measuring the (very small) voltage difference between two points from 10 to 200 feet apart. From this value and the conductivity of the pipe (obtainable from tables) the value of the current may be calculated. Sudden or gradual changes in value or direction must indicate either current gain or current loss; current loss is inevitably associated with corrosion (unless the flow is through a connected metallic conductor.

The three tests just described are for the purpose of determining where and how severely a line is corroding or is likely to corrode. Some other tests are as follows:

Current Requirement Test. This test in principle is quite simple. It consists merely of placing a pipe line, or a section of one, under temporary partial or complete cathodic protection. From the data thus found, it is possible to compute the current which will be required for complete protection. Present knowledge as to the requirements of a bare line is such that frequently the test is not required. However, the actually achieved degree of effectiveness in coating a line is impossible to estimate, and the test is needed for the design.

In conducting the test, a location is selected for the drainage of the test current. Before any current is drained, however, a set of normal or "static" pipe to soil potentials is taken at points along the line, for as great a distance as it is anticipated that the test can possibly reach. For the current source, anything from a welding machine to a storage battery may be used—knowing which one is a valuable part of the engineer's first guess! The temporary anode may consist of driven rods or

pipes. Sometimes salting the ground around them is required to lower the resistance sufficiently. The DC source is then connected, the positive terminal to the anode and the negative to the pipe, and the test started at the selected value of current.

If, for example, a test current of 50 amperes is used and it is found that ten miles of pipe line is brought up to protective levels (0.85 volt negative to a copper-copper sulfate electrode), then the average current requirement for the line is 5 amperes per mile. This value is valid only for current drainages in the neighborhood of 50 amperes; if, say 10 ampere units were used at closer spacing, the current demand might be 4 amperes per mile.

Coating Resistance Test (or coating conductance). This test involves a similar arrangement to that used in the preceding, but the objectives and the calculations are different. The results here are obtained in terms of the average potential change of the pipe per unit of current, and are expressed as square-foot-ohms resistance or as microhms per square foot conductance. This value is not needed as such for cathodic protection design, but is useful in comparing coatings, in following coating deterioration, and in evaluating conformity to legal and contractural requirements.

Coating Continuity Test. By the use of a machine of the Pearson type, of which there are several available, holidays or breaks in the coating, may be located at any time after the line is buried. The economics of this inspection are doubtful, insofar as the actual line inspected is concerned, but the data gained are valuable if part of a continued study on coatings and coating practices. Normally, holidays found by the machine are excavated for inspection and analysis.

Selection of the System . . .

Although the decision to protect a line may be made on a strictly economic basis, the choice between galvanic anodes and impressed current systems may be influenced by other factors. Neither system is superior; some cases are clear cut, but many are borderline. A tabulation of the merits and disadvantages of both types may be of assistance in making the choice for a particular application:

Galvanic Anodes—Advantages

1. Easily installed where needed.
2. Usually most economical on small installations.
3. Low current density in soil means less interference.
4. Flexibility of application for "hot spot" application.
5. No external power source required.

Galvanic Anodes—Disadvantages

1. Low driving voltage with respect to steel.
2. Output depends on soil resistivity; not applicable in high resistivity soils.
3. Regulation of output to cope with varying demands is not easy.
4. Resurvey costs are high, due to large number of drain points.

Rectifier Systems—Advantages

1. Large capacity in one unit; may be as high as 2000 anodes.
2. Adjustable output after installation.
3. Easy supervision; meters on unit can be read by inexperienced personnel.
4. Supervision costs low, due to small number of drain points.

Rectifier Systems—Disadvantages

1. Power costs high in some locations; power not always available.
2. High current densities may cause interference problems.
3. Large units involve some wasted power due to excessive protection near units.
4. Components subject to physical failure; a single failure means loss of large section of protection.

Sample Calculations for Design . . .

CASE 1

We have 10,000 linear feet of bare (uncoated) 4-inch outside diameter line which lies in soils of 1500 to 800 ohms per cubic centimeter. Because such soils are known to be quite corrosive we should protect this line in its entirety. Assume that we are to use magnesium anodes. Reference to the Soil Resistance vs. Anode Output chart shows that an anode will produce approximately 100 milliamperes of current in average 1000 ohm soil. If we assume that we will need 1 milliampere per square foot of pipe surface we can determine the total amount of anodes we will need, thus:

$$\frac{4'' \times 3.14}{12} \times 10{,}000 = 10{,}700 \text{ square feet surface}$$

$$10{,}700 \text{ square feet surface} \times 1.0 \text{ milliamperes} = 10{,}700 \text{ milliamperes}$$

$$\frac{10{,}700 \text{ milliamperes}}{100 \text{ ma/anode}} = 107 \text{ anodes, distributed}$$

$$\frac{10{,}000'}{107} = 93' \text{ spacing (approx.) for the anodes}$$

Thus you would install 107 17-pound anodes, placing them each about 93 feet apart.

To design a rectifier system you would probably assume a requirement of 3 milliamperes per square foot of pipe surface, the extra amount of cathodic current being required due to excess "peaking", the higher current density near the rectifier being wasted. Thus:

$$\frac{4 \times 3.14}{12} \times 10{,}000 = 10{,}700 \text{ square feet of pipe surface}$$

$$10{,}700 \times 3.0 = 32{,}100 \text{ milliamperes} = 32.1 \text{ amperes}$$

Thus a rectifier of about 32 amperes output capacity would probably provide the desired protection, if it was

MEASURING UP

EVERY LENGTH of Basalt-Kaiser Steel line pipe measures up to the rigid specifications of the nation's pipe line companies.

This is possible because every step in pipe making, from raw materials mining to finished fabrication, is controlled by us, assuring pipe of highest quality.

During production, Basalt-Kaiser Steel pipe must measure up to 52 rigid tests to make certain it fulfills your requirements for on-the-job workability and durability.

Add to this Kaiser Steel's *prompt service* and *wide range of sizes* and it's clear why pipe men rely on . . .

Kaiser Steel

KAISER STEEL PIPE SPECIFICATIONS • All pipe manufactured to latest A.S.T.M. and A.P.I. specifications

Type	Diameter	Length	Wall Thickness	Shipping Point
Continuous Weld—Threaded and Coupled	½" to 4" nominal I.D.	Uniform 21'	Standard	Fontana, Calif.
Continuous Weld—Plain End	2⅜" to 4½" O.D.	Up to 40'	Standard	Fontana, Calif.
Electric Resistance and Fusion Weld—Plain End	14" to 18" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser
Electric Resistance Weld—Plain End	5⅛" to 12¾" O.D.	Up to 55'	.188" to .375"	Fontana, Calif.
Electric Fusion Weld—Expanded—Plain End	20" to 30" O.D.	Up to 40'	.250" to .500"	Napa, Calif.—Basalt-Kaiser

Prompt, dependable delivery at competitive prices • KAISER STEEL CORPORATION Los Angeles, Oakland, Seattle, Portland, Denver, Tulsa, New York

For more data on advertised products, use Readers' Service Cards, last page.

Oil & Gas Journal
New Pipe-Laying Record
IF you want to lay a pipeline faster, take advantage of the human competitive element.
That's what Service Pipe Line Co. did in building its 625-mile crude-oil line from Fort Laramie, Wyo., to Freeman, Mo., a
themselves.
Two contra
completed w
was done without any special organization within Service Pipe Line.
There was a normal incentive to hurry for both Service and its contractors, O. R. Burden Construction Corp., Tulsa, and H. B. Zachry Co., San Antonio. For Service there was the
Wall Street Journal
Pipeline 625 Miles Long Completed in Just 61 Days
Special to The Wall Street Journal
TULSA Welding of the final link in a 625-mile Wyoming-Missouri crude oil pipe line was completed by Service Pipe Line Co. just 61 days after the job was started.
Completion of the line, which will broaden crude transpor'ation facilities out of the Rock
oil fields, was be-
astest pipe-laying
to the company.
10 miles a day of
ameter line was
vith better than
machines used.
Fort Laramie,
Freeman, Mo.,
Pipe Line Industry
WHAT'S HAPPENING
IN PIPE LINE CONSTRUCTION
Service Line Completed in Record Time
Service Pipe Line Company, a transporter of crude oil, set a world's record for laying large-diameter pipe when the final weld on its 625-mile Wyoming-Missouri line was completed at noon, November 15. The
1600 feet behind,
was
of-way option was taken on August 18 and the first pipe shipped from the mill August 20. The first survey crew was in the field August 24, and contracts for construction were awarded August 25.
the project into

Allis-Chalmers Tractors help Zachry Rush Work on Record-Setting 10-mile-a-day pipe-laying job

On one of the most publicized pipe-line operations of 1954, men and machines pushed through Service Pipe Line Company's 625-mile, 20-24-inch pipeline job from Ft. Laramie, Wyoming, to Freeman, Missouri, at the amazing rate of 10 miles per day. Leading industry publications acclaim the operation as a world's speed record for setting large-diameter pipe — faster than the Big Inch lines of World War II or any postwar pipe-line undertaking.

Speed for Welders

There's big work capacity in the 10-ton, 84-belt-hp HD-9. Highly maneuverable, it helped fast-moving welding crews roll along. Side boom operates through front power take-off, independent of master clutch, leaving rear of tractor free for winch. With dual clutch side boom control — one for raise, the other for lower — the operator merely pulls one lever to switch from *raise* through *neutral* to *power down* — no gear shifting necessary. According to Zachry personnel, the combination of the HD-9's speed and the smooth, fast-working side boom was a very important factor in the success of the operation.

Speed on Dozing

This rugged 15-ton 124-belt-hp HD-15 Tractor speeded operation on both right-of-way clearing and cleanup. With the Allis-Chalmers simplified shift pattern, it takes just half the time and effort to change from low forward to fast reverse on the HD-15 — you shift one lever instead of two. On short-run dozing jobs where frequent shifts are required, the HD-15 can make five passes in the time usually required to make four — actually increasing production up to 25 percent.

Speed on Cradling and Lower-In

Twenty-ton powerhouse provides the big lift. Pictured is the 175-net-engine-hp HD-20 Torque Converter Tractor cradling 20-inch pipe for dope-wrap machines. With torque converter drive — an Allis-Chalmers first in crawler tractors — it's easy for operator to match speed to clean-prime or dope-wrap machines with unequalled smoothness. Operator regulates speeds through throttle control. Walter Bauerschlag, Colorado section spread foreman, said the extra lifting capacity of the HD-20 Tractors enabled them to stay well away from the ditches and avoid cave-ins due to sandy soil conditions. The 20's ability to stay clear kept lowering-in operations moving at a fast, steady pace.

Allis-Chalmers Tractors Help Maintain "Race Horse" Pace

H. B. Zachry, San Antonio, Texas, operated four spreads with Allis-Chalmers tractors to handle the western half of the job. Two spreads were 100 percent Allis-Chalmers equipped. Tractors were delivered new by the dealer. These consisted of:

- *4 HD-20 Torque Converter Tractors with side booms*
- *6 HD-15 Torque Converter Tractors with side booms*
- *8 HD-15 Tractors with angle dozers*
- *5 HD-9 Side Boom Tractors with unique front control clutches*
- *2 HD-9 Tractors with backfillers*

According to Mr. A. "Pup" Vaughn, General Superintendent, even at this top-speed pace, no operating time was lost because of equipment downtime on either of these two all-Allis-Chalmers spreads.

Dealer Service Excellent

The Zachry personnel was highly complimentary of Allis-Chalmers dealer service. Delivery of equipment was fast and complete. The machines arrived on schedule in top shape, ready to go to work. On-the-job dealer cooperation was excellent.

Zachry Rates Allis-Chalmers Best

Based on performance, both Mr. Zachry and Mr. Vaughn were outspoken in their praise of Allis-Chalmers pipe-line equipment. They regard it as the finest available today.

Convince Yourself With a Demonstration

Find out as others have, how this equipment can speed your jobs. Your Allis-Chalmers dealer will be happy to demonstrate.

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

For more data on advertised products, use Readers' Service Cards, last page.

Stop Corrosion!

WITH *Harco* CATHODIC PROTECTION SYSTEMS

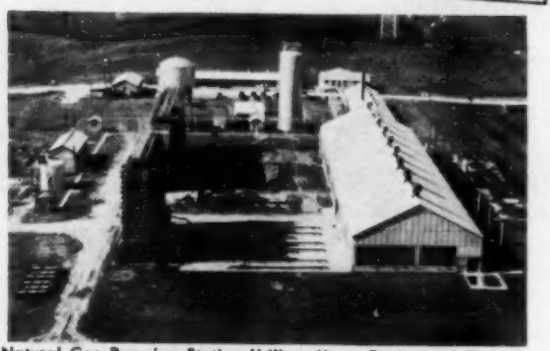
Industry's No. 1 Enemy can be stopped by HARCO.

Now there is a "police force" ready to help you in stopping thief corrosion. Harco engineers are defeating the ravages of electrolytic corrosion of underground and underwater piping.

HARCO JOB-ENGINEERED SYSTEMS provide necessary testing, drawings, materials, installation and maintenance.

HARCO INSTALLATION CONTRACTING is completed to customers specifications and covers as much of total job as required. HARCO will assist in evaluation and solution of your particular problems.

Stop the thief Corrosion Now!
Specify HARCO . . . FIRST IN THE FIELD OF CATHODIC PROTECTION.
Write today for catalog or call MOntrose 2-2080



Natural Gas Pumping Station Utilizes Harco-Engineered Cathodic Protective System to Eliminate Corrosion in Underground Lines

THE *Harco* CORPORATION *Cathodic Protection Division*
17019 Broadway • Cleveland, Ohio 6188-HC

Cleveland • New York • Chicago • Philadelphia • Detroit • St. Louis • Louisville • Minneapolis • Oklahoma City • Los Angeles • Seattle • Houston • Atlanta • Lynchburg • Pittsburgh • Albany • Davenport • Toronto, Canada

situated near the midsection of the pipe line. Locating it elsewhere would change the protective picture. It should be mentioned here that the protective criterion is the attainment of a — 0.85 volts pipe-to-soil potential (Cu-Cu So_4 reference electrode) or a negative change of potential of as much as — 0.25 volts. Either is satisfactory. Acquiring more than this is usually excess protection (oftentimes rather expensive); attaining less will mean that the line is not protected.

CASE 2

In this example we have a 4-inch OD line of 10,000-foot length that has ten "hot spots" on it, each about 100 feet long. They were located by the Surface-Potential method. Let's see what we need to protect it.

$$\frac{4'' \times 3.14}{12} \times 100' = 105 \text{ square feet per 100-foot "hotspot".}$$

Thus, a 17-pound magnesium anode in 1000-ohm soil will produce roughly enough current to protect the 100-foot "hot spots". Ten of these anodes will protect all of the hot spots and therefore, we assume, the total length of the pipe line.

Reference to the **Soil Resistance vs Anode Output** graph shows that the anode will not produce enough current for protection if the soil is 1500 ohms resistance, and will produce too much current if the soil resistance is of the order of 800 ohms. Depending on the case, it may be necessary to use larger or smaller anodes to receive the required theoretical life expectancy for the anode. Approximate life of an anode may be determined roughly as below:

Size anode	*Total anode current*	*Theoretical Life (Yrs.)*
17 pound	100 milliamps	10
32 pound	180 milliamps	10
50 pound	250 milliamps	10

This is based on a theoretical 550 to 600 ampere hours of life per pound of magnesium, at 50 percent efficiency.

CASE 3

In this case we will use the same 10,000 linear feet of 4-inch OD line, lying in corrosive soil (determined by the Soil Resistivity method), but with an old coating on the line. Upon conducting a Temporary Cathodic Current Requirement Test we find that a total of 5 amperes of current will be required by an undistributed (rectifying) system. Thus, we install a 5 ampere, or 8 or 10 if we wish insurance, rectifier somewhere near the midpoint of the pipe line. Or we may install it at one end, but then the Current Requirement Test should be conducted from the same end.

We know that we can get by with approximately one-third of the 5 amperes, or 1.66 amperes using magnesium. Thus, in 1000-ohm soil we will need $\frac{1.66}{0.1} = 16$ anodes distributed to produce the desired protection.—**The End**

Economics Is a Basic Problem

Continued from Page 56

every minute detail of his operations? Obviously a line has to be drawn, and although it is not easy to specify the exact location, the principle involved is simple; the cost of the investigation itself cannot be allowed to become greater than the possible savings to be had. The decision as to the location of this point can only be determined by judgment and experience. This type of judgment is not limited to petty details. It appears as a major factor in some of the larger operations.

For example, in the application of protection to a coated line by the use of galvanic anodes, it is theoretically possible, by means of a meticulously accurate survey of the soil, and an equally exhaustive survey of the coating discontinuities, to select a set of anode locations which will afford protection at an absolute minimum of expense—for the installation. Such a survey, however, and the analysis which would be needed, would cost far more than an effective installation which would be adequate, although not minimal.

It is strongly suspected that some of the detailed surface potential surveys conducted on cross-country lines actually cost more than the possible saving as compared with an over-all protection program. In congested areas, where the interference problem is acute and installation costs are high, detailed surveys are reasonably justified.

Then there is the problem of allocation of time and attention. Usually the corrosion engineer must choose among a large number of problems and line sections, as to which will receive investigation first. The choice should be based on the principle of attacking first the areas in which the greatest possible savings can be made. It is likely, however, to be made on the basis of who is clamoring the loudest. At best, it must be made by guess rather than by an actual evaluation, although a little time—which is money—spent on evaluation can result in a better guess.

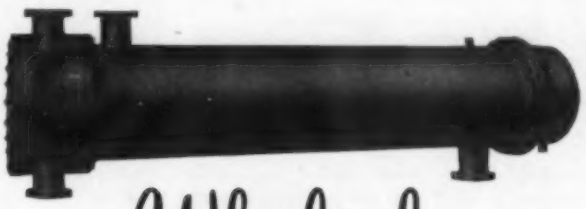
Finally, it must be pointed out that economic decisions of the kinds described do not make up the whole of the corrosion engineer's work, important though they may be. Too often the engineer, either employe or consultant, feels that he has discharged his duty when he has made a study of the problem and submitted his report and recommendations. *Actually, he does not serve faithfully the best interest of his employer or client unless he follows up his recommendations with persuasion*—the act of communication is not complete until the ideas expressed in the report have truly entered the mind of the responsbile, decision-making representative of management. Putting them on paper is only a first step.

And so it inevitably follows that, to accomplish his real aim, the corrosion engineer must divide his time and effort. He must subtract a portion from the purely technical activities of his position, and devote it to the task of selling his conclusions and decision to those who alone can sign the authorizations and set them into motion. This decision, the division of effort between these two categories, must also be evaluated in terms of maximum return from total effort—in the end, it is but a part of the job of making the total expenditure for all phases of corrosion costs—damage, remedial measures and all—as low as it is possible to make it. —**The End**

PROTECT YOUR COMPRESSORS FROM WASTE HEAT

The efficient operation of your compressors — in fact, their *life* — depends on the removal of waste heat from lubricating oil and water cooling systems. The Whitlock Type SG Cooler is specially designed for such service. It is small yet capable of handling relatively high heat loads, and its standardized design means low cost and prompt shipment.

The cooler is two-pass in design and properly baffled to develop high fluid velocities and subsequent high heat transfer rates, with minimum pressure drop. Its non-ferrous tube bundle, cast iron channel and steel pipe shell mean long, trouble-free equipment life even under severe operating conditions. Bulletin 122 gives you the whole story on Whitlock Lube Oil and Jacket Water Coolers. For your copy, just fill in and return the coupon today.



Whitlock

WHITLOCK Designs and builds: bends, coils, condensers, coolers, heat exchangers, heaters, piping, pressure vessels, receivers, reboilers.

THE WHITLOCK MANUFACTURING CO.
98 South Street, Hartford 10, Conn.

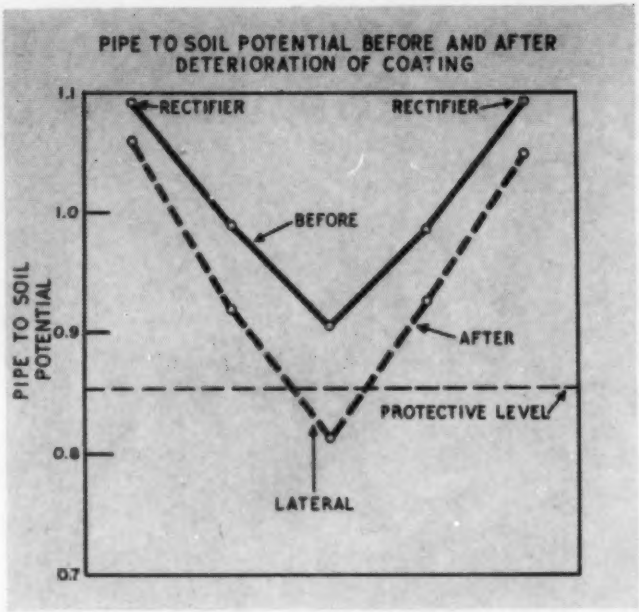
☐ Please send Bulletin 122 describing Whitlock Lube Oil and Jacket Water Cooler — Type SG.

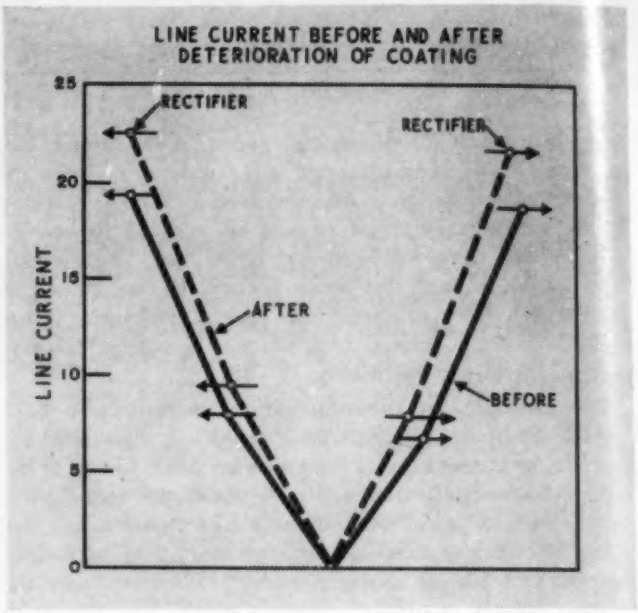
Name .....

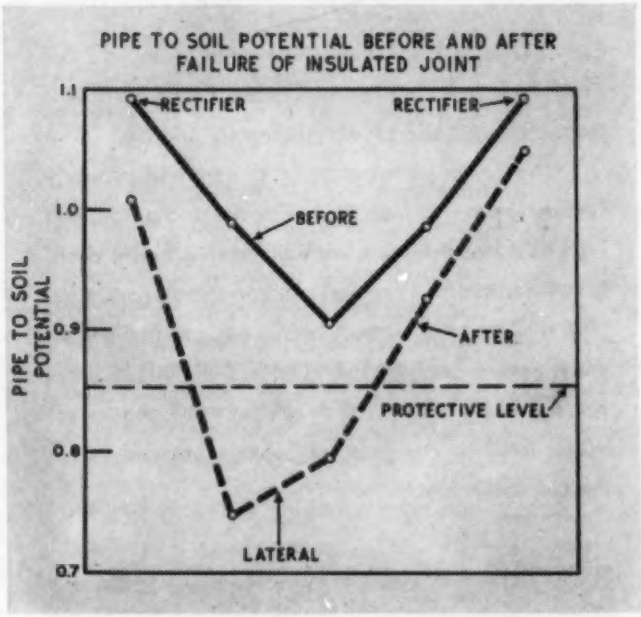
Title .....

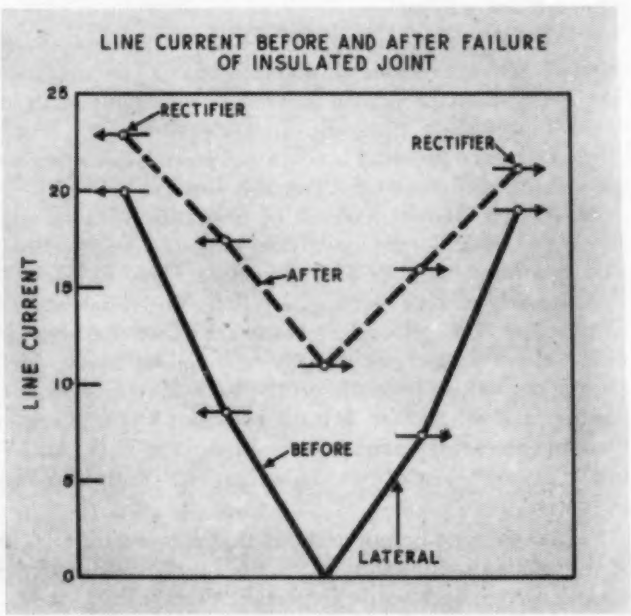
Company .....

Address .....









HOW PERIODIC SURVEYS SHOW FAILURES IN CATHODIC PROTECTION SYSTEMS

Corrosion Protection a Continuous Job

Underground conditions are changing constantly. Without efficient maintenance and inspection even the best protection system may be a failure.

By HENRY ALLEN, Allen Cathodic Protection Company, Inc., Houston

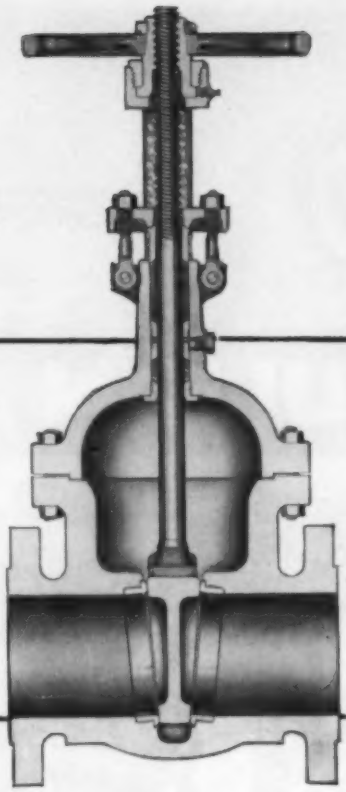
THERE OFTEN IS a lamentable tendency to assume continued protective operation of a cathodic protection system once it has been installed. But without efficient maintenance and inspection even the best protection system may be a failure. As compared with the small cost of periodic supervision and inspection, the neglect of this important task is a major economic error.

The present trend is to install the

let valves of
known dependability
keep your piping costs
in line

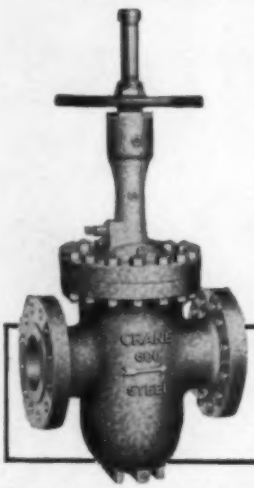
CRANE

Here are some of the most famous valves in pipeline service—famous for their greater suitability, dependability, and long-range economy. The consistent success of Crane pipeline valves is easy to understand when you consider the background . . . dating clear back to the early days of the petroleum industry.



CRANE CAST STEEL WEDGE GATES

The pioneer steel valve that has never been topped in quality and performance. A stronger and more rugged valve because of Crane skill in steel casting. Dependable wedge gate design with solid wedge-type disc. Long, close-fitting guides assure accurate seating—minimize wear. Crane *Exelloy* trim on all seating surfaces provides the resistance you want against erosion and wear. Deep, lantern-type stuffing box assures tightness and long packing life. Crane Cast Steel Wedge Gates are available in a wide range of sizes with flanged and welding ends; 150, 300, and 600 lb. class.

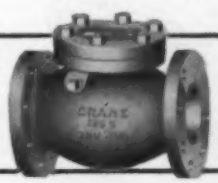


CRANE CONDUIT-TYPE GATES CLASS 600

Even infrequent operation won't affect their efficiency, for all working parts are sealed in grease. Dual-seating double disc is fully seated in open as well as closed position, thereby solving erosion problems. Conduit-type disc ports coincide exactly with seat openings for smooth, clear flow with minimum pressure drop. Full-Way or Venturi patterns for working pressures up to 1440 pounds, oil or gas. Sizes 2 to 30 inch.

CRANE IRON BODY WEDGE GATES

You see plenty of these dependable 125-pound Crane valves along the nation's pipelines. Adaptable for all types of services, they feature an exceptionally strong oval-shaped body and bonnet. Available with either double disc or solid wedge disc. OS&Y and non-rising stem patterns, brass trimmed or all-iron. Screwed or flanged end valves available. Complete range of sizes.



CRANE IRON BODY SWING CHECKS

Well-proportioned, sturdy valves, globular in shape to provide ample flow. *The disc cannot stick in open position.* All-iron or brass trimmed, whichever your service demands. All-iron valves have seating surfaces cast integral with body and disc. Seat ring in brass-trimmed valves is screwed into the body. All sizes have the hinge suspended in the body, permitting simplified change-over to outside lever and weight. Sizes up to 24 inch.

THE BETTER QUALITY . . . BIGGER VALUE LINE . . . IN BRASS, IRON, STEEL

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

For more data on advertised products, use Readers' Service Cards, last page.

MODEL MV (Special)
CUSTOM BUILT DROP FRAME VAN
MODEL ALV
ALL ALUMINUM VAN
MODEL FVLA
COMBINATION STEEL & ALUMINUM
The LUFKIN Line
DEFINED... MEANS
Diversification
For Every Purpose...
A MODEL MANUFACTURED, DESIGNED, AND ENGINEERED TO
Allow you...
1 PERFORMANCE
2 DEPENDABILITY
3 LOW FIRST COST
4 SAFETY
5 LIGHTWEIGHT
6 APPEARANCE
7 LONG LIFE
8 MINIMUM MAINTENANCE
When you choose a LUFKIN you get all the above features in one package
MODEL TBF-G
LIGHTEST WEIGHT GRAIN TRAILER
MODEL TBF
ALL PURPOSE FLOAT
MODEL THF
HEAVY CENTER-FRAME ALL PURPOSE FLOAT
MODEL TOF
STANDARD OIL FIELD FLOAT—50,000 LBS.
MODEL TBF-C
STURDY LIVESTOCK TRAILER
MODEL TOP
PIPE AND POLES
MODEL FVL
LIGHTWEIGHT—ALL STEEL
MODEL OVL
LIGHTWEIGHT—OPEN—TOP ALL STEEL
MODEL OVLA
LIGHTEST WEIGHT ALUMINUM OPEN TOP
AMERICAN
MODEL MV
DROP FRAME WAREHOUSE AND MOVING VAN
CUSTOM-BUILT TANDEM DROP FRAME
MODEL TOF-H
HEAVIEST-DUTY OIL FIELD FLOAT 80,000 & 100,000 LBS.
LUFKIN TRAILERS
DIVISION OF LUFKIN FOUNDRY & MACHINE CO.
FACTORY: LUFKIN, TEXAS • Phone 3-4425
BRANCHES AND SALES OFFICES
HOUSTON • DALLAS • ODESSA • SWEETWATER • WACO
CORPUS CHRISTI • SAN ANTONIO • LUBBOCK • SHREVEPORT

cathodic protection system as a part of the original construction. Soon after the line is placed in operation, the system is completed, and checked out as supplying full protection throughout the length of the line. To expect that it will continue to do so indefinitely, without attention, is to believe in a miracle of engineering.

There are two general areas in which failures may take place—in the protection system itself, or by means of some change in the protected structure or its environment. Perhaps the largest single factor which can influence operation of a system is the deterioration of the coating with time.

The coating is an extremely important part of the total protective system, and continued protection depends upon its ability to maintain insulative properties. Decrease in resistance brings with it the need for increased amounts of protective current. When the decrease is excessive or premature, protection may be lost before it is realized.

One of the first steps in protecting a pipe line system is to isolate it from all foreign structures by means of insulating joints. Failure of one of these joints can throw such an additional load on the protective system as to deprive many miles of line of protection. Connection of some extraneous structure to the line during operation may impose an additional load that is excessive. This connection of an extraneous structure may be accidental as by contact with a crossing line.

Rectifier type system maintenance is most easily checked at the unit itself.

A selenium rectifier, the type most commonly used, is ordinarily equipped with an ammeter and a voltmeter. Reading of these meters is a simple task, which should be delegated to any convenient personnel. Data may be taken daily, weekly or monthly. Anything less frequent than monthly is hazardous. Many, but not all, possible troubles will make themselves known by changes at this point.

Frequent readings are valuable, not only because of the time saved but because they make more obvious the occurrence of a sudden change. General changes usually are of less importance.

In order to detect any failure of

Why
Lightweight
RIDGID
Tristand Pipe Vise 40A
makes your work easier

Extra easy to set up...
built-in folding steel tray pushes up easily to fold legs of Tristand for easy carrying; tray pushes down easily to set up, holds stand solidly rigid.

Handy Work Bench...
extra-strong stand and tray all one unit. Full size vise-base has 3 benders, ceiling brace screw, lots of tool slots, besides handy tool tray. Most for your money—your Supply House has them, can demonstrate and deliver fast!

THE RIDGE TOOL COMPANY • ELYRIA, OHIO, U.S.A.

RIDGID
Work-Saver Pipe Tools

For more data on advertised products, use Readers' Service Cards, last page.

protection it is necessary to check the terminal function—the final criterion of protection. If every point along the length of a pipe line is maintained at a potential of at least 0.85 volt negative with respect to a copper-copper sulfate reference electrode, the line is considered fully protected. Any voltage less than 0.85 leaves doubt as to the degree of protection. If the line is coated properly, determination of pipe-to-soil potential at a set of test points usually will determine how completely the line is protected approximately midway between protective units.

(When there is a great disparity in size between adjacent units, the electrical midpoint is closer to the smaller unit.)

Assurance of protection can only be had by setting up a procedure to conduct this survey at appropriate intervals. On different lines, the interval may vary from monthly to annually.

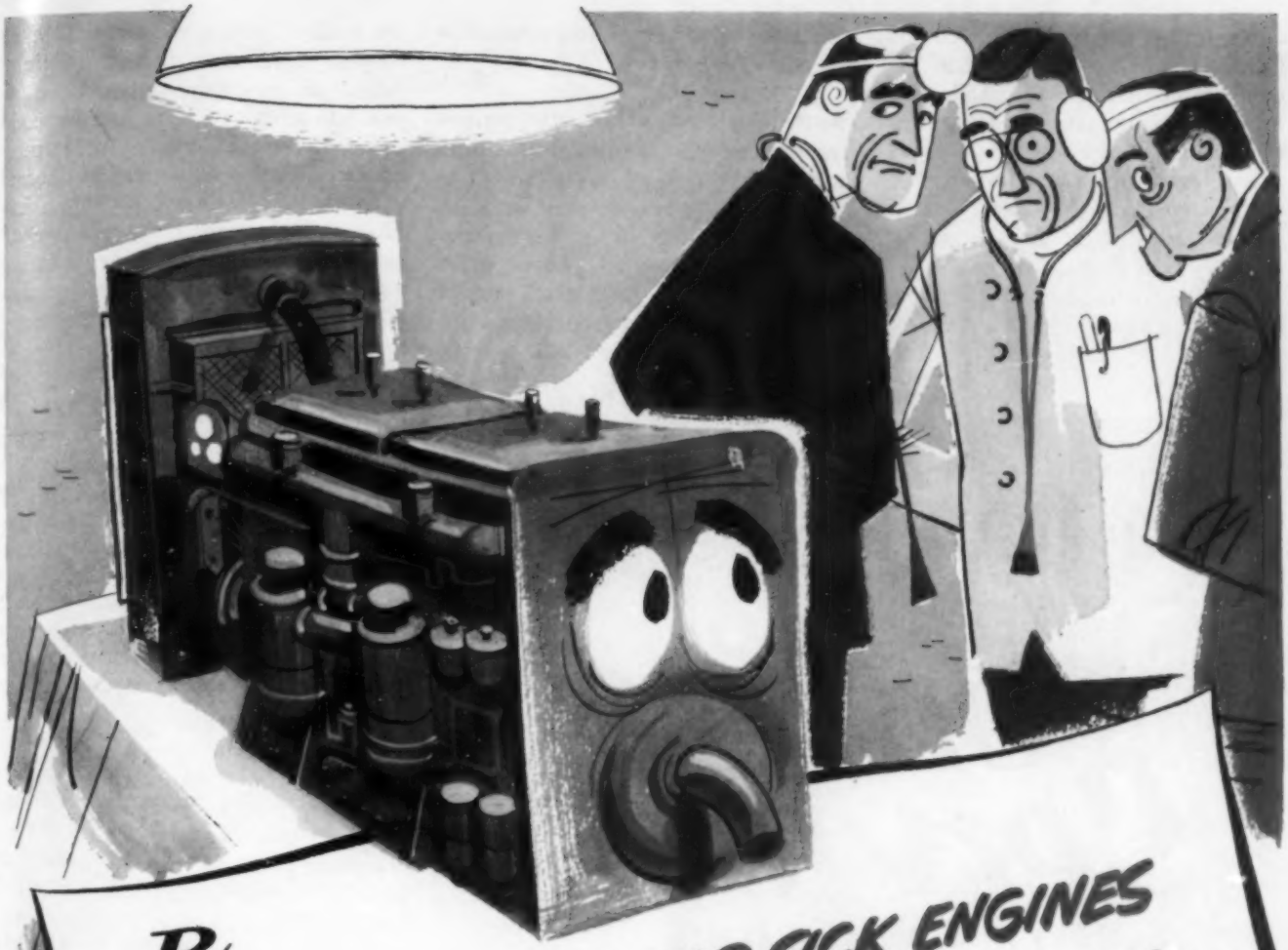
A monitor station installed at some point reasonably remote from any protection unit, but one which is visited regularly by personnel on regular duties, facilitates good maintenance.

This station consists of a voltmeter connected between the protected pipe line and a reference electrode. Ordinarily, instead of using the conventional copper sulfate, a water line is used, or perhaps a buried zinc anode. The reading of the voltmeter will not be identical with a standard pipe-to-soil potential, but it can be correlated with it. Gas lines, in particular, find these monitors useful at meter or regulator locations. Every time the site is visited, a reading is taken (simply by pushing a button) and the value reported to the corrosion section. Where a protected pipe line is separated from an unprotected line by an insulating joint, the voltmeter can be connected across the joint.

Interference—the influence of a cathodic protection system on structures other than the one it is designed to protect—is a serious and growing problem. It is virtually impossible to build a pipe line without crossing many others already in the ground. It is also quite common for several pipe lines to occupy the same right-of-way for a part of their length. Every one of these crossings and parallelings is a possible source of interference in both directions. Control of these problems can only be achieved by cooperation between the engineers representing the various companies involved. Surveys must be made. In most instances bonds can be installed connecting the various lines in such a way as to minimize or eliminate mutual damage. One recently-installed pipe line system has rectifiers with a total current drainage of about 40 amperes. Of this amount, nearly 15 amperes is drained from other lines to avert damage. In addition, some 10 amperes is drained to other lines at different points, so that, in this case, the total net protection is approximately equal to that supplied by the company's own units. In another case, however, four times as much current (in one section) is drained, through bonds, to a set of crossing bare lines as is supplied to the system itself.

Interference can be minimized by design through the use of high quality

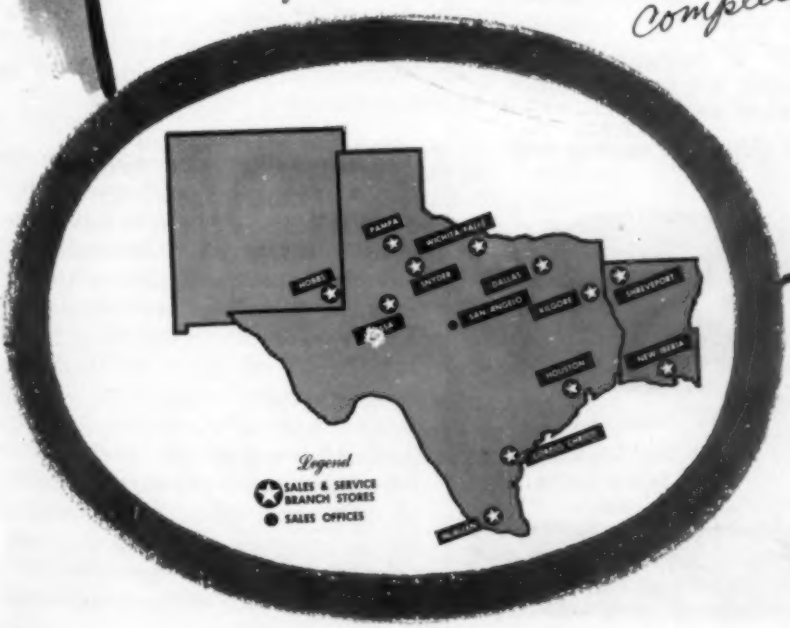
ARCCO
The World Over
wherever there is gas
ARCCO-ANUBIS
'Dry-Air GAS
GRAVITOMETERS
This new Arcco-Anubis Dry Air Gas Gravitometer determines and records specific gravity of gases automatically corrected to the humidity content of the air. The difference in weight between a column of GAS and equal column of DRY AIR is measured. This ratio represents the true specific gravity of the sample.
One bell of the instrument is filled with gas which is being measured, and the other bell is filled with dry air. Otherwise, except for the new instrument having one column for gas and one column for dry air, the unit is identical in operation to the standard gas gravitometer. When calibrated and properly installed, these instruments require little attention other than to wind the clock, ink the pen, and change the chart. Send for bulletin No. 101.
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
Available for Early Delivery
SEND FOR BULLETIN NO. 101



Rx PRESCRIPTION FOR SICK ENGINES

Send them home to one of the 11 completely equipped Waukesha Sales & Service, Inc. branches near you, for complete expert service

WAUKESHA REPAIRS M.D. (Minus Downtime)



WAUKESHA

Sales & Service, Inc.

1422 MAURY ST. • HOUSTON, TEXAS

EXCLUSIVE DISTRIBUTORS FOR WAUKESHA PRODUCTS IN TEXAS, NORTH AND WESTERN LOUISIANA, SOUTHERN ARKANSAS AND NEW MEXICO

For more data on advertised products, use Readers' Service Cards, last page.

coatings, by careful choice of unit locations, and by the use of a relatively large number of small units. From the maintenance and operation standpoint, eternal vigilance is required to detect any changes. New lines, newly installed cathodic systems on other lines, changes in their output, and other factors can affect the problem. Periodic joint surveys by all interested parties are needed. Often the services of an independent consultant are of value in making an impartial survey and recommending an equitable solution.

Rectifiers and other equipment used in cathodic protection are, quite naturally, subject to failure. The selenium stacks now in most common use have a rated life, under normal load, of some 30,000 hours. Many individual stacks give much longer service than this, but some fail earlier. Only frequent inspection can prevent prolonged loss of protection following such a failure. A careful plot of output values may disclose incipient failure or premature aging. Gradual loss in current output as the unit ages is normal, however. Transformer oil for oil-cooled units must be chosen with care, since some oils contain inhibitors and detergents which are of value in other applications, but actually attack the selenium stacks. Such oils must not be used in rectifiers.

Routine maintenance surveys on galvanic anode installations are similar to those recommended for rectifier systems, but they do have certain inherent differences. The larger number of units used makes a complete check of performance time-consuming and more expensive.

Overlap of protection between adjacent sections is such that a rapid check of potentials at about every third mid-point may be considered adequate. A more complete survey need only be made at longer intervals, such as annually. Because of the lower potentials usually achieved, accidental contacts with foreign or parasite structures results in a greater loss of protection than might occur in a rectifier system.

Installation of a cathodic protection system on an existing coated line does not differ in principle from that on a new line. Current demand is likely to be greater and may vary more irregularly from section to section along the line. Maintenance problems may be somewhat different in that an older line may not show a very rapid rate of coating deterioration, since it has already passed through its most rapid period of aging.

The scheduling of procedures for maintenance supervision and control of a cathodic protection system involves many variables. Setting up an economical and effective schedule calls for knowledge and experience. Larger organizations can easily maintain full-time personnel with the necessary instrumentation to perform this work. Smaller systems can often profitably engage the services of others and thereby gain the benefits of wider experience, more complete instrumentation, and competence developed in full-time practice in a highly specialized field. —**The End**

ToPaz

one for all Service

SUPPLYING ALL PIPELINE MATERIALS...PLUS COMPLETE ENGINEERING SERVICE

If you are required to furnish high quality materials and equipment for pipeline construction or maintenance, you can enjoy the following benefits of TOPAZ "one for all" SERVICE.

1. All materials and equipment furnished by one supplier, eliminating unnecessary time and paper work.
2. Fast, dependable service of a company large enough to supply all your needs, but small enough to give personal attention to each order.
3. Complete consulting, internal cleaning, testing and inspecting services.

AGENTS FOR:
T. D. WILLIAMSON, INC.
THE HOLCOMBE CO., INC.

Tod Pazdral
PIPELINE SPECIALTIES

ToPaz

2525 South Blvd. • Houston, Texas • Office Phone JA-1403

Tod Pazdral, Consulting & Supervision, Home Phone MA-5680
Jack Pelkey, Sales & Service, Atlanta
Richard Lee McHenry, Sales & Service, Dallas

GROVE SEAL "O" RING VALVES • TIPTON WELDING CLAMPS, HOOKS & DOLLIES • ALSTON PIPE CUTTING MACHINES • FLEETLINE PIPE SADDLES & REDUCERS • H & M CUTTING & BEVELING MACHINES • ANDERSON EQUIPMENT CO. HEAVY MACHINES • ORDER FROM TOD PAZDRAL

PIPE LINE PROGRESS

26-inch A. O. Smith line pipe on location during Interprovincial's 1954 looping program.

Interprovincial's third looping project uses 386 miles of A. O. Smith line pipe

A. O. Smith supplied 386 miles of pipe to Interprovincial Pipe Line Company for its 1954 looping program. This total includes 190 miles of 24 inch pipe and 196 miles of 26 inch pipe. Our shipments, each on schedule, started in May and the loop was completed in October.

On the job from the start, A. O. Smith has served Interprovincial in three key phases of line construction. We supplied all the 20-in. and 18-in. pipe used in the company's original line from Edmonton, Alberta, to Superior, Wisconsin. The 20-in. main links Edmonton and Regina . . . while the 18-in. line completes the run from Gretna, Manitoba, to Superior. Total here was 864 miles of line pipe.

The second looping project brought another call for A. O. Smith line pipe — 135 miles of 24-in. pipe to loop the Saskatchewan and Manitoba sections in the system.

A. O. Smith is proud to have participated in the building of this great transcontinental system — the world's longest crude line — now transmitting western Canadian crudes all the way from Edmonton to Sarnia, Ontario. This participation demonstrates our ability to meet delivery schedules anywhere on the continent. Both our Milwaukee and Houston mills served to supply Interprovincial with high quality, internally expanded, welded line pipe.

A. O. Smith line pipe is available in a complete range of sizes and wall thicknesses, from 8⅝-in. to 36-in. diameters.

Through research ... a better way

A.O.Smith

CORPORATION

TUBULAR PRODUCTS DIVISION

Milwaukee 1, Wisconsin

Chicago 4 • Dallas 2 • Houston 2 • Los Angeles 22
Midland 5, Texas • New Orleans 12 • New York 17 • Pittsburgh 19
San Francisco 4 • Seattle 1 • Tulsa 3 • Washington 6, D. C.
International Division: Milwaukee 1, Wisconsin

PRESSURE & TEMPERATURE
SAFETY
PROTECTION

MERCOID®
MERCURY SWITCH EQUIPPED
CONTROLS
SERIES "D"
FOR PRESSURE & TEMPERATURE

Over a million of these mercury switch equipped controls are in use throughout every industry in the world SAFE-GUARDING costly equipment against HAZARDOUS pressure and temperature conditions.

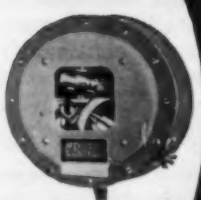
Pressure types are available in 17 pressure ranges from 0-30" vacuum to 300-2500 psi with the sensitivity your application requires. Temperature types range from minus 30° to plus 60°F., up to 370-530°F. with varying sensitivities dependent upon range selected.

All types are bourdon tube operated and are equipped with external adjustments, visible dial and the famous Mercoid sealed mercury contact.

FOR ALL TYPES OF SERVICE

FOR GENERAL PURPOSE
Nema 1

WEATHER-PROOF OUTDOOR SERVICE
Nema 1A, 2, 3, 4



EXPLOSION-PROOF HAZARDOUS LOCATIONS
Class 1, Group D
Class 2, Group E, F, G.

Our engineers are at your service—send in your control problem or WRITE FOR CATALOG 700B

THE MERCOID CORPORATION
4211 Belmont Ave., Chicago 41, Ill.

DR. GORDON N. SCOTT
1955 Award Winner

O. C. MUDD
The Winner in 1950

DR. SCOTT P. EWING
Honored in 1953

STARR THAYER
1952 Winner

ACTIVE PIPELINERS who have won the Frank Newman Speller Award for outstanding contributions to corrosion engineering are pictured above. Dr. Gordon N. Scott, a consulting engineer in Los Angeles, has been named the winner of this year's award.

NACE Meeting Marks Its First Ten Years

Pipeliners organized it and now it is nationwide and dedicated to saving billions of dollars annually.

By MELVIN A. JUDAH, Pipe Line Industry Staff

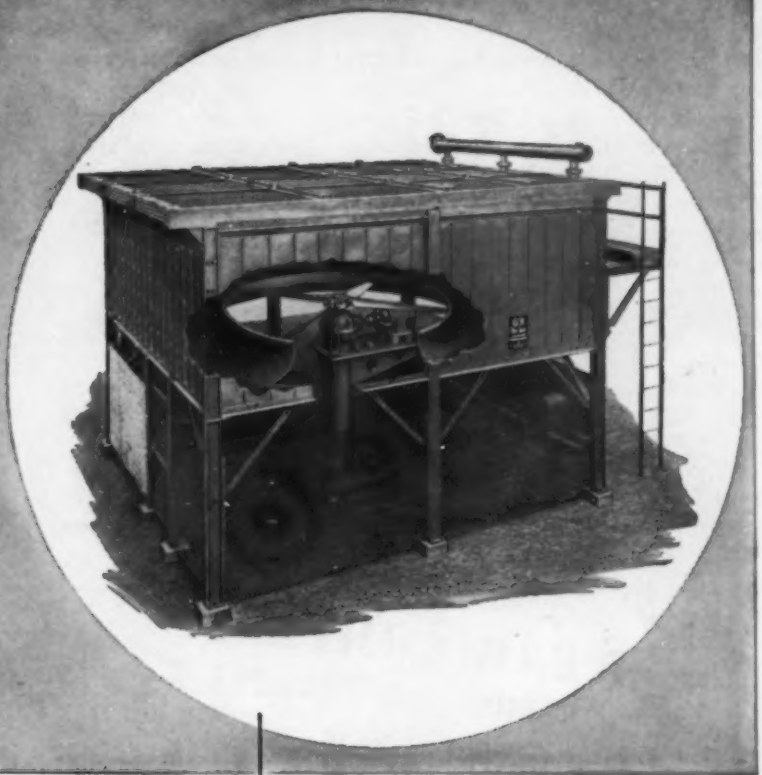
The National Association of Corrosion Engineers starts a second decade of activity with its annual meeting in Chicago, March 7-11. Pipeliners in the organization may well feel some pride in the growth and activities of the NACE during the first ten years of its life, for it was a small group of engineers from this phase of the industry which originally joined together to form the association. After giving it a sound foundation they saw the wider scope of corrosion problems and encouraged men from other industries with related problems to join in these cooperative control efforts.

First moves toward organization of

G-R fin-fan

more *than ever your best buy in*

AIR-COOLED HEAT EXCHANGERS



more *Applications*

The **fin-fan** exchanger is readily adaptable to practically every condensing and cooling application, particularly when the use of cooling water involves problems of supply, cost, scale or corrosion. Such flexibility is just one of many features, which make the G-R **fin-fan** your best investment in air-cooled apparatus.

more *Advantages*

Many important design and construction advantages are incorporated in the **fin-fan.** These include 100% effective cooling surfaces; maximum heat transfer afforded by exclusive G-R K-Fin Cooling Sections; fully prefabricated structure; predrilled supports, providing for addition of future units; *plus* bell-type fan ring for maximum efficiency with minimum horsepower required for fan.

more *Installations*

More square feet of K-Fin tubing, which forms the heat transfer surface, are being used in more types of air-cooled installations than any other design. Reason? Dependable ratings, design and workmanship backed by over 85 years of specialized experience in building quality heat transfer apparatus for varied services all over the world.

more

Dependable because completely G-R

The new G-R **fin-fan,** *completely G-R,* can be depended upon for structural strength, peak operating efficiency, ease of installation, operation and maintenance. It is a complete self-sustained unit combining the best transfer service available with tested and proved air circulation equipment. As a result of exhaustive tests conducted on the complete equipment over a six month period G-R can offer you *guaranteed performance* based on actual test data. This is just one more important reason why the new G-R **fin-fan** is your best buy in air-cooled heat exchangers.

GR931

G-R HEAT TRANSFER APPARATUS

THE GRISCOM-RUSSELL CO., MASSILLON, OHIO

A Subsidiary of General Precision Equipment Corporation

fin-fan Air-Cooled Heat Exchanger

For more data on advertised products, use Readers' Service Cards last page.

an association of corrosion engineers began in March 1936 when a group of pipe line operators met in Houston to form the Mid-Continent Cathodic Protection Association. They discussed interference problems arising from cathodic protection of underground structures and later formed a permanent committee to negotiate differences among pipe line operators whenever difficulties arose involving cathodic protection systems. Another committee function was to arrange for notification of other operators when such installations were planned by a member.

Out of these early activities and later work within the Petroleum Industry Electric Association developed the present organization that was incorporated as the NACE in Texas in October 1945. Early national meetings were devoted almost exclusively to corrosion engineering problems within the pipe line industry. The first officers of the association were pipe line engineers. Russell A. Brannon, Humble Pipe Line Company, was elected president at the first national meeting in Houston in April 1944. Pipeliners continued to hold the reins as F. J. McElhatton, Panhandle Eastern Pipe Line Company, and G. R. Olson, United Gas Pipe Line Company, succeeded to the presidency of the young group. Dr. Ivy M. Parker of Plantation Pipe Line Company, was named editor of the association's journal and she has served continuously since.

Activities of the association are directed to meet definite objectives:

1. To promote the prevention of corrosion, thereby curtailing economic waste and conserving natural resources.

2. To provide forums and media through which experiences with corrosion and its prevention may be reported, discussed and published for the common good.

3. To encourage special study and research to determine the fundamental causes of corrosion, and to develop new or improved techniques for its prevention.

4. To correlate study and research on corrosion problems among technical associations to reduce duplication and increase efficiency.

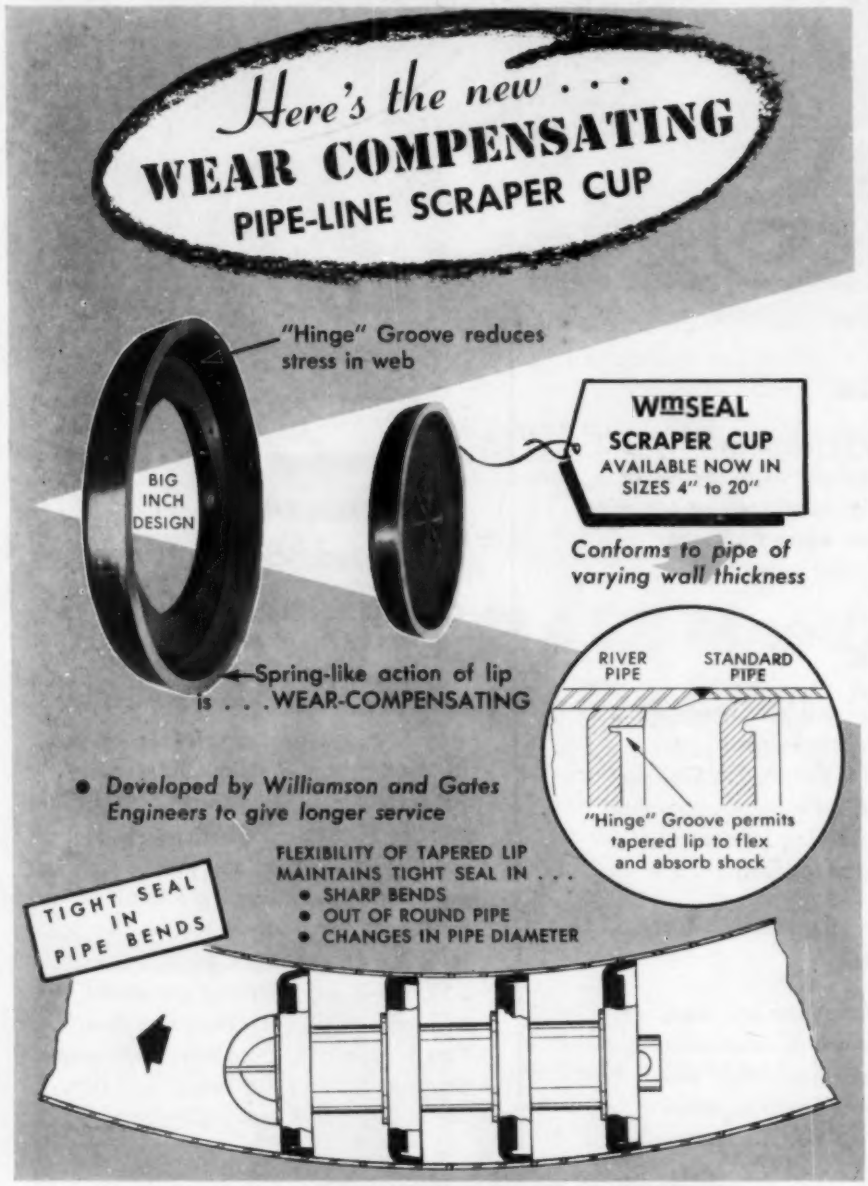
5. To promote standardization of terminology, techniques, equipment, and design in corrosion control.

6. To contribute to industrial and public safety by promoting the prevention of corrosion as a cause of accidents.

7. To foster cooperation between individual operators of metallic plant and structures in the joint solution of common corrosion problems.

8. To invite a wide diversity of membership, thereby insuring reciprocal benefits between industries and governmental groups as well as between individuals and corporations.

Research and education. These formal objectives have been grounded in


Here's the new . . .
WEAR COMPENSATING
PIPE-LINE SCRAPER CUP
"Hinge" Groove reduces stress in web
BIG INCH DESIGN
WmSEAL
SCRAPER CUP
AVAILABLE NOW IN SIZES 4" to 20"
Conforms to pipe of varying wall thickness
Spring-like action of lip is . . . WEAR-COMPENSATING
RIVER PIPE
STANDARD PIPE
"Hinge" Groove permits tapered lip to flex and absorb shock
• Developed by Williamson and Gates Engineers to give longer service
FLEXIBILITY OF TAPERED LIP MAINTAINS TIGHT SEAL IN . . .
• SHARP BENDS
• OUT OF ROUND PIPE
• CHANGES IN PIPE DIAMETER
TIGHT SEAL IN PIPE BENDS
T.D. Williamson, Inc.
THE PIG WITH THE POKE
CLEANS PIPE LINES
P. O. BOX 4038
TULSA 9, OKLAHOMA
REPRESENTATIVES: Houston • Pittsburgh • Kenilworth, N. J. • Amarillo • Casper • Provo, Utah • Los Angeles Oakland • Baton Rouge • Edmonton • London, Ontario • Calgary • Buenos Aires • Durban, Natal, South Africa

Sections of this recently completed 462-mile products line of the Oklahoma-Mississippi Products Line, Inc., running through Arkansas from Duncan, Okla., are corrosion-protected by Transhield.

Johns-Manville TRANSHIELD® ASBESTOS PIPE LINE FELT

goes on fast, restricts soil stress, cuts maintenance

Transhield Asbestos Pipe Line Felt meets the need for a felt that is economical yet effective in all ordinary soil conditions.

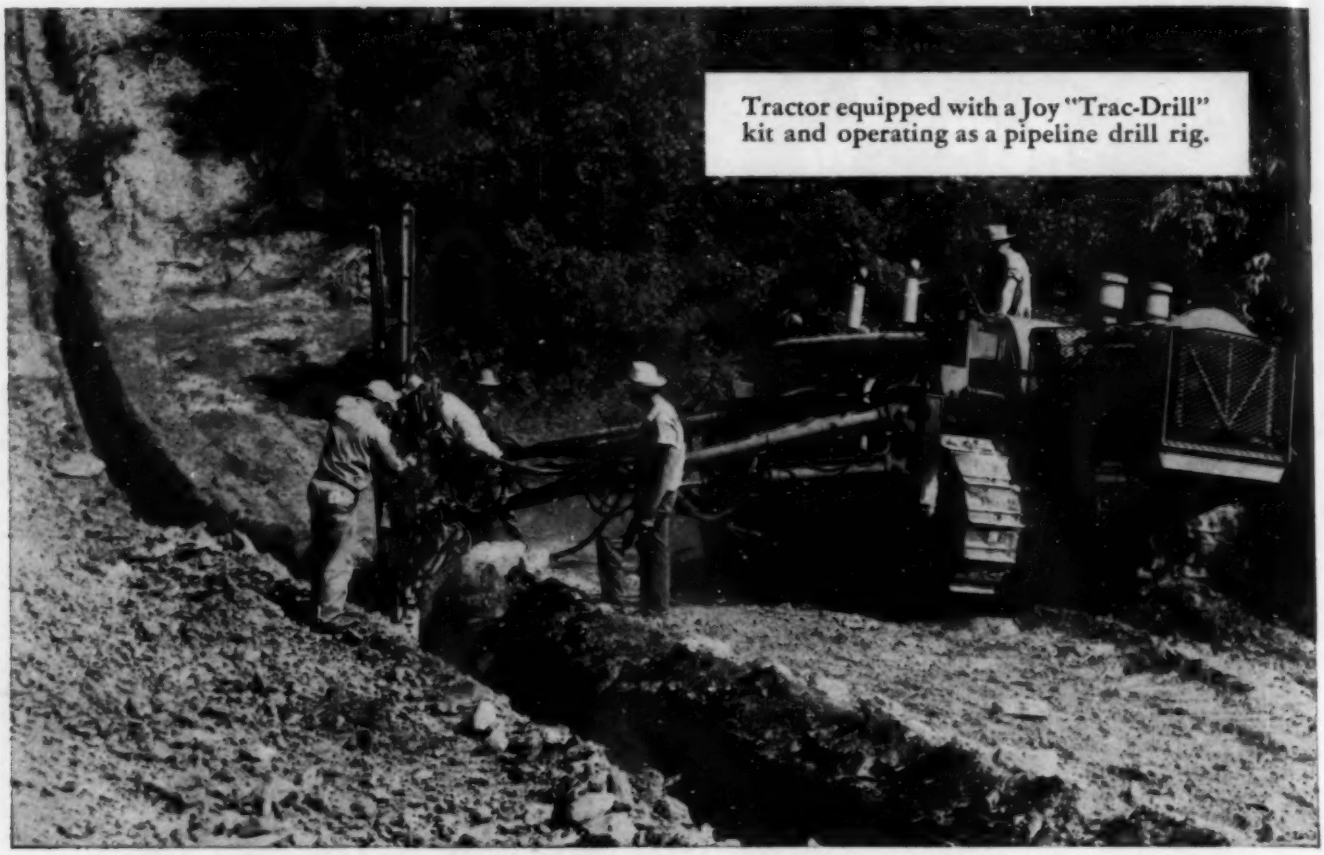
Designed for easy, high-speed application by modern machine methods, Transhield is strong, light in weight, and highly tear-resistant. Longer length rolls increase application speeds since fewer stops to replace rolls are required. Transhield's highly desirable characteristics are attained through an innovation in felt construction. It consists of a lightweight coal-tar saturated asbestos felt, reinforced with continuous glass yarns parallel-spaced on ¼" centers.

Because Transhield is a continuous membrane between the pipe line enamel and the soil, it works effectively toward preserving a continuous protective film of enamel on the pipe. It guards the enamel during construction and, after installation, it reduces the cold flow of the enamel, acting as a surface barrier to restrict soil stress.

• •

For further information about Transhield, write to Johns-Manville, Box 60, New York 16, New York; in Canada, 565 Lakeshore Road East, Port Credit, Ontario.

JOHNS-MANVILLE JM PRODUCTS **Johns-Manville** PRODUCTS FOR PIPE LINE PROTECTION



Tractor equipped with a Joy "Trac-Drill" kit and operating as a pipeline drill rig.

THE JOY "TRAC-DRILL"

A PIPELINER RIG THAT GETS THERE FASTER TO SAVE YOU TIME AND MONEY

This PIPELINER, the Joy "Trac-Drill," is a packaged drill-and-compressor unit for pipeline drilling that is easily assembled on *your* tractor. The assembly kit consists of drill and compressor "packages" and instructions for assembly. Drill package includes Joy Silver Streak Drills, Hydro Drill Jibs, mounting bracket, hydraulic pump and other accessories. Compressor package includes a Joy WL-80 compressor, mounting bracket, air receivers, etc.

Two drills are mounted on dual, hydraulically-actuated Joy Hydro Drill Jibs. With these jibs, the drills are quickly and easily positioned and are held absolutely stationary during drilling. This is a real "Pipeliner" rig . . . the double drill arrangement permits the drilling of several holes from each tractor setup.

The Joy "Trac-Drill" moves and operates as one self-contained unit. It moves in on those tough spots in the spread faster because there is no need to tow a separate source of compressed air into the area.

Consult a Joy Engineer TODAY for details on how you may equip your tractor for pipeline drilling. ● ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Consult a Joy Engineer

ABOUT Stationary and Portable Compressors . . . Rock Drills . . . Rock Bits . . . Electrical Connectors . . . Portable Lighting Lines.

WAD C-5363

JOY

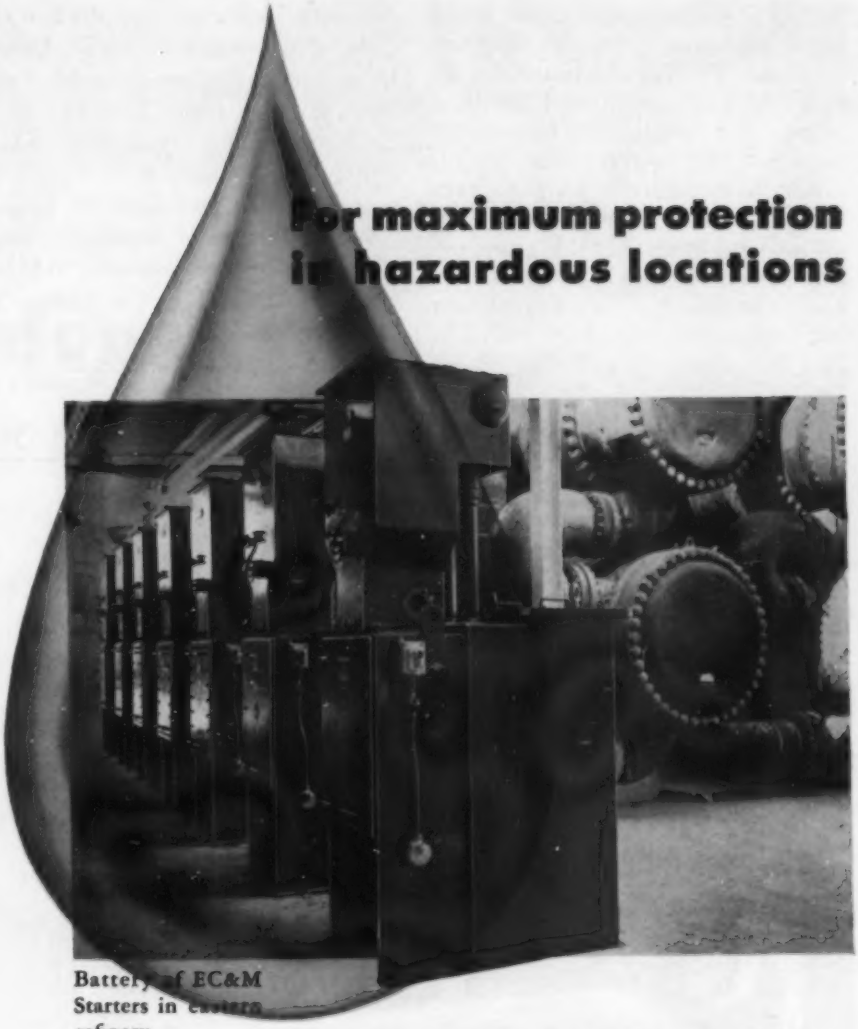
CONSTRUCTION EQUIPMENT MANUFACTURERS FOR OVER HALF A CENTURY

real cooperative work among industries and individual engineers. Almost at the start the NACE began the formation of technical committees and they have continued to grow in number and results. Ten committees are now working on special problems encountered in the operation of pipe lines. Groups are studying galvanic anodes, anodes for impressed currents, minimum current requirements, standardization of procedures for measuring pipe coating leakage conductance, internal corrosion of pipe lines and tanks, coal tar coatings for underground use, asphalt type pipe coatings, pipe wrapping materials, and prefabricated plastic films for application to pipe lines. Pipeliners profit too from work of other groups who study such related subjects as coatings, inhibitors and oil and gas well equipment corrosion.

Corrosion short courses sponsored by local NACE sections help to bring the fundamentals of corrosion control to superintendents, foremen, and field men in practical and understandable language. University short courses, also encouraged by the association, teach fundamental theories of corrosion to engineers who need to advance their knowledge of corrosion processes and keep up with latest research.

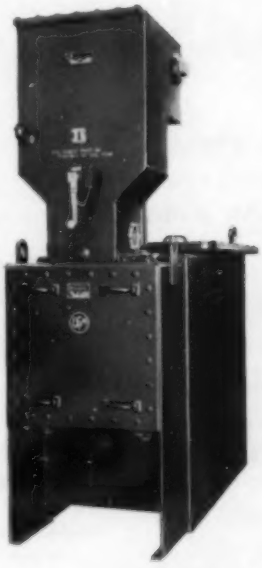
The program for the 1955 conference has several features for pipe line corrosion engineers. In addition to general program subjects and equipment exhibits, several symposia are devoted exclusively to pipe line corrosion problems. (See schedule of events on page 80.)

NACE Award to Scott. Dr. Gordon N. Scott, has been named the 1955 winner of the Frank Newman Speller award for outstanding contributions to corrosion engineering. Dr. Scott, a consulting engineer in Los Angeles, has done research on underground corrosion of pipe lines and protective coating testing. Perhaps his most important work was carried out while he was research associate for the American Petroleum Institute and the National Bureau of Standards from 1928 to 1934. During that time he studied corrosion mitigation in the oil industry and conducted nation wide tests of protective coatings on operating pipe lines. From 1935 to 1936 he was



Battery of EC&M Starters in eastern refinery.

OIL-IMMERSED
50,000 KVA INTERRUPTING CAPACITY
MOTOR STARTERS
BY EC&M



This installation is another example of the increasing acceptance of EC&M oil-immersed Motor Starters by refinery engineers and construction and design companies. The inherent advantages of these starters are high interrupting capacity (50,000 kva or VALIMITOR type for bus of unlimited kva) and assurance of a compact, neat installation.

These slender space-saving starters with self-contained Oil Disconnect Switch require less floor space . . . result in greater area around each unit for inspection and maintenance.

Write for illustrated 16-page Booklet 6062 for full details.

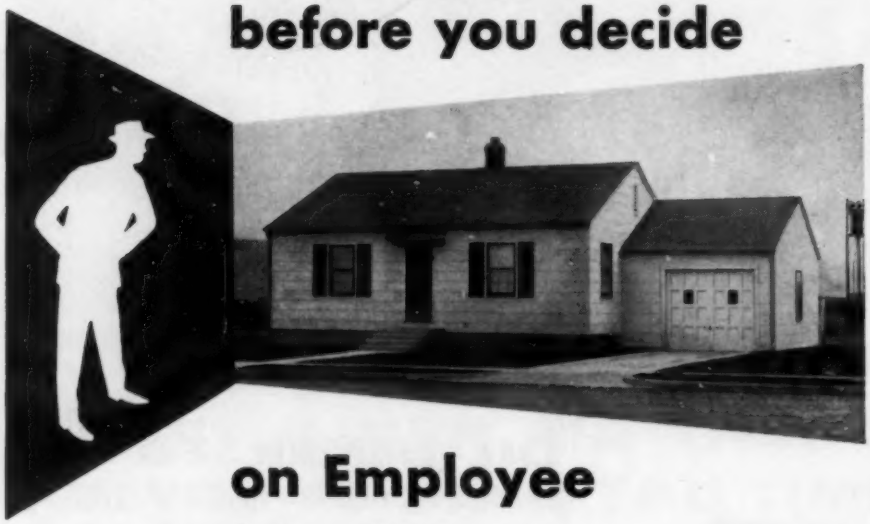
THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

For more data on advertised products, use Readers' Service Cards, last page.

line technologist for the API in Dallas correlating information on pipe line corrosion. Dr. Scott has written 23 technical publications and his book on pipe line coatings has been recognized as a text on the subject.

NACE engineering awards have honored several representatives from the pipe line industry. Of the nine engineers that have been recognized for their outstanding efforts in corrosion engineering, six have been active in pipe line corrosion studies. Frank Newman Speller received the first engineering award in 1947. Others named were the late John M. Pearson, Sun Pipe Line Company; F. L. LaQue, International Nickel Company; O. C. Mudd, Shell Pipe Line Company; the late Kirk H. Logan, National Bureau of Standards; Starr Thayer, pipe line corrosion consultant; Scott P. Ewing, The Carter Oil Company, and E. H. Dix, Jr., Aluminum Company of America.

See us FIRST before you decide



on Employee housing . . .

MANUFACTURERS OF SPECIAL MILLWORK: DISTRIBUTORS OF CURTIS WOODWORK, JOHNS-MANVILLE BUILDING MATERIALS

Is it more convenient to house your employees in city homes? How about building conventional houses near your operations? Will trailer camps fill the bill?

Before you decide on any housing plan, our almost 40 years of employee housing experience should be of value to you. You will be under no obligation to hear our convenient, low cost plan for housing both employees and equipment. Write for information today.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

NACE TECHNICAL PROGRAM FOR PIPE LINE MEN

Wednesday AM—March 9
Pipe Line General Symposium

Internal Plastic Coating of Pipe Lines in Place—J. C. Watts, Humble Pipe Line Company.

A Discussion of the Committee T-2D Report—Proposed Standard Method for Measuring Electrical Conductance of Coating on Buried Pipe Lines—L. F. Heverly, Buckeye Pipe Line Company.

Cybernetics, Psychology and Corrosion—Marshall E. Parker, consulting engineer.

Wednesday PM—March 9
Power and Communications Symposium

Atmospheric Galvanic Couple Corrosion—K. G. Compton, A. Mendizza and W. W. Bradley, Bell Telephone Laboratories, Inc.

Corrosion on the Florida Keys—R. W. Ackermann and J. P. McArdle, American Telephone and Telegraph Company.

The Use of Half Cells for Field Corrosion Testing—Robert Pope, consultant.

Thursday AM—March 10
Cathodic Protection Symposium

Organization and Activity of the Corrosion Control Group of a Large Public Utility—J. W. McAmis, Washington Gas Light Company.

A Study of Protective Criteria on a Pipe Section in a Uniform Environment—L. P. Sudrabin, Electro Rust Proofing Corporation.

Instrumentation for Cathodic Protection—H. N. Hayward, University of Illinois.

Thursday PM—March 10
Pipe Line Clinics

Cathodic Protection Clinic.

Internal Corrosion Clinic—Pipe Lines and Storage Tanks.

Protective Coatings Clinic.

Friday AM—March 11
Pipe Line Underground Corrosion Roundtable

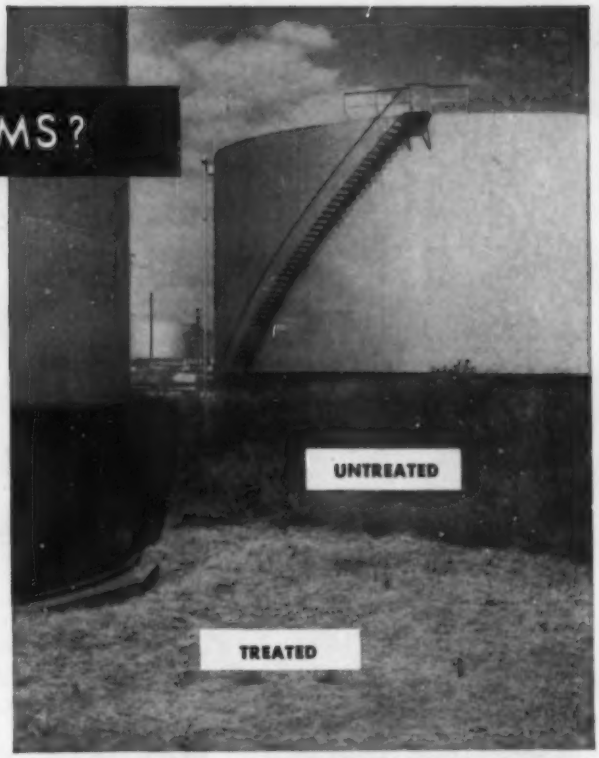
Use Readers' Service Cards

For information on New Equipment described in this issue, for copies of the Catalogs and Literature reviewed, and for data on any advertised product, use the blue Readers' Service Cards on the last page, just inside the back cover. Circle the code number on the card corresponding to the editorial or advertising items desired. Sign and mail the postcard. Your requests will be forwarded to the manufacturer and the information mailed directly to you.

WEED PROBLEMS?

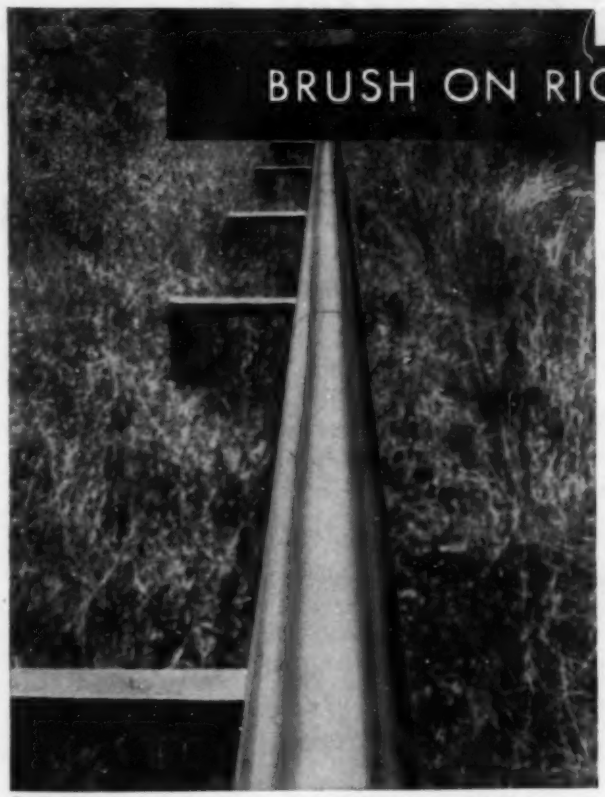
One application of **Du Pont Telvar®** WEED KILLERS stops weeds for the season—or longer!

"Telvar" kills weeds through the roots . . . prevents regrowth. Low rates (20 to 80 lbs. per acre) make it cost little for the results you obtain . . . also mean less handling, fewer storage problems. To cut maintenance costs to new low levels, put "Telvar" in your weed-control program. Available in two formulations: "Telvar" W, and "Telvar" DW.



"Telvar" is ideal for weed control around tank farms, pipelines, pumps and derricks. It's non-toxic to humans and animals, non-flammable, non-volatile and non-corrosive to equipment.

BRUSH ON RIGHT-OF-WAY?



Brush along this pipeline was cleared and kept down with "Ammate." "Ammate" allows low-growing cover to return to resist erosion.

One application of **Du Pont Ammate®** WEED AND BRUSH KILLER kills more kinds of brush —safely—at lower cost!

"Ammate" kills more kinds of brush and keeps it down longer than most weed and brush killers! When the original spray job is done well, brush is kept under control for years with only an occasional spot spray. You can rely on "Ammate" to do the job safely, even where your right-of-way adjoins cropland, because "Ammate" is not volatile. There are no vapors to drift onto sensitive crops. It is no hazard to crews, stock or wildlife.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. For your copies, write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, Box 660, Montreal.

On all chemicals always follow directions for application. Where warning or caution statements on use of product are given, read them carefully.

Telvar® Weed Killers for industrial use

DU PONT REG. U. S. PAT. OFF.

Ammate® Weed and Brush Killer

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTR

The KEY MAN on the *Service* TEAM

He Offers You a Specialized SERVICE

He is YOUR Salesman — Serviceman who heads a SERVICE TEAM of Underwriters, Safety Engineers, Auditors and Claimsmen. Each member of this team brings specialized training and experience to YOUR Workmen's Compensation needs.

Have this team work for YOU. Find out the advantages of Texas Employers' Net Cost Plan which offers you improved service and SAVES YOU MONEY.

Millions of Dollars saved policyholders by Texas largest writer of Workmen's Compensation.

HOMER R. MITCHELL, *Chairman of the Board* A. F. ALLEN, *President*

Service Offices: ABILENE • AMARILLO • AUSTIN • BEAUMONT • CORPUS CHRISTI • DALLAS • EL PASO FORT WORTH • FREEPORT • GALVESTON • HARLINGEN • HOUSTON • LUBBOCK • MIDLAND ODESSA • PORT ARTHUR • SAN ANGELO • SAN ANTONIO • SHERMAN • TYLER • WACO • WICHITA FALLS

TEXAS EMPLOYERS INSURANCE ASSOCIATION
HOME OFFICE - DALLAS, TEXAS

Brannon

Johnson

Wade

Riordan

Parker

Meet Our Authors for This Issue . . .

75 years of experience between them in this comparatively new field of corrosion protection engineering.

Henry Allen, of Allen Cathodic Protection Company, Harvey, La., has gained experience in a variety of corrosion problems with special emphasis on the marine application of cathodic protection. Prior to organizing his own company he was with McCarthy Chemical Company and Dow Chemical Company. Allen has ten year's experience in corrosion engineering. He is an active NACE member and was one of the organizers of its New Orleans section.

•

Russell A. Brannon of Humble Pipe Line Company is well acquainted with control of internal corrosion in pipe lines. He studied chemical engineering and business administration at the University of Texas and following graduation in 1928 joined Humble as a chemist to work on water treatment and corrosion problems. Brannon was the first president of NACE and since 1950 has served as its treasurer. He is chairman of the API Sub-committee on Internal Corrosion of Crude Oil Pipe Lines and Tanks. As a member of the API Committee on Personnel Training he is active in the preparation of a series of handbooks on Oil Pipe Line Transportation Practices. He has been active in many NACE committees and in the Houston Pipe Liner's Club.

•

Wayne A. Johnson, owner of Corrosion Rectifying Company, Houston, specializes in design and installation of cathodic protection systems. He was formerly with Texas Pipe Line Company and has had a variety of experience with corrosion problems on oil and gas pipe lines, city distribution systems, and offshore pipe lines and platforms. Johnson is a graduate of Texas A. & I. College and has been active in NACE and the Houston Pipe Liner's Club.

•

Marshall E. Parker joins the PLI staff as a guest editor of this special corrosion engineering issue. Parker's experience and talent were valuable in the preparation and editing of articles on latest developments in corrosion work. He is recognized as a writer on these special problems having written many articles for industry publications in addition to his PLI feature "You Asked About Corrosion" and the field manual "Pipe Line Corrosion and Cathodic Protection." Parker has studied mathematics and physics and holds degrees from Sam Houston State Teachers College and Rice Institute. He began engineering duties with Houston Light and Power Company and later became a corrosion engineer with Pan American Pipe Line Company. He is a registered professional engineer in Texas and has been a consultant on pipe line corrosion problems since 1950. NACE activities with technical committees and short courses have taken up some of his "spare" time.

•

Maurice A. Riordan, a general partner in Rio Engineering Company of Houston, is a graduate of Rensselaer Polytechnic Institute with a degree in metallurgical engineering. He served four years in the U. S. Navy as an electronics specialist and after World War II joined Dow Chemical Company where he engaged in electrochemical research and development in cathodic protection. Riordan now specializes in field investigation, design and installation of cathodic protection systems. He has been active in NACE and lectured on corrosion principles and cathodic protection fundamentals at NACE short courses for operating pipe line personnel at Houston and Tulsa.

•

O. W. Wade is a corrosion engineer with many talents. He graduated from the University of Wichita with a degree in mechanical engineering and joined Pratt & Whitney as a test engineer. A licensed radio engineer, he also flew with Pan-American Airways as a radio engineer and navigator. Pursuing an interest in bi-metallic couples in aircraft engines, he joined Great Lakes Pipe Line Company in 1946. His duties ranged from design of terminals to field engineering. He became interested in corrosion and has devoted all of his time to this work since joining Transcontinental Pipe Line Corporation in 1950. Wade has been busy in many NACE activities including furnishing an entertaining musical program (with Mrs. Wade's accompaniment) at a recent Houston section meeting.

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas

Use Germanium Diodes

When necessary to install bonds between crossing or parallel lines to avert possible damage by interference currents of the respective cathodic protection systems, locations and resistance values of these bonds are based on the assumption of continued operation of the protection units. Failure of a single unit may result in current flow through a bond which imposes an unduly large load upon the protective devices of the innocent company.

Avoid this extra load by using germanium diodes (rectifiers) in the bond so there can be no reversal of current flow should a unit fail. Germanium is preferable to the older selenium and copper oxide units in this application because it exhibits a low resistance even at very low voltages—the potential difference may be on the order of a few tenths of a volt.

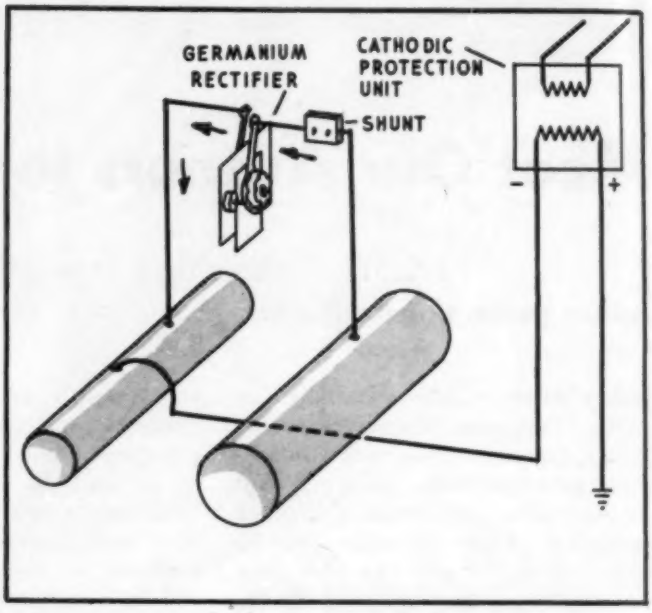
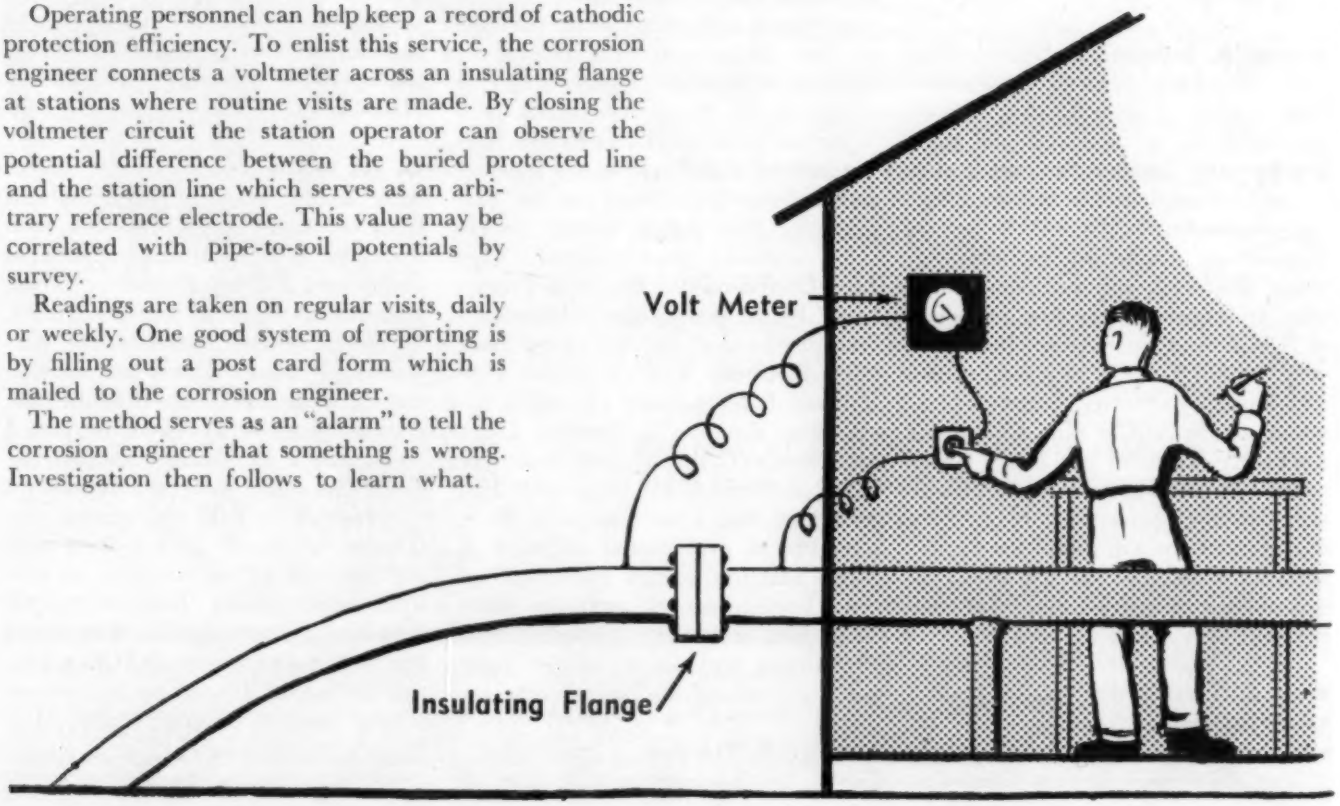


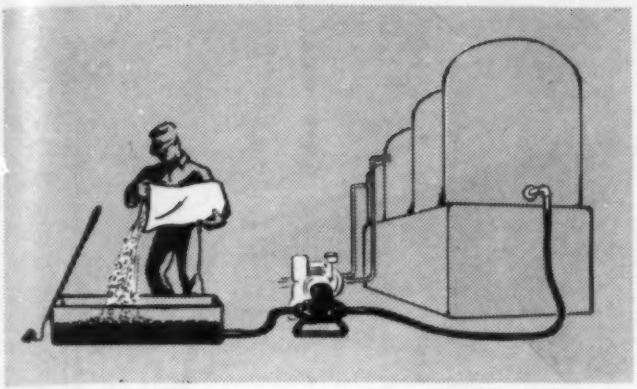
Chart Changer Sends Readings by Post Card

Operating personnel can help keep a record of cathodic protection efficiency. To enlist this service, the corrosion engineer connects a voltmeter across an insulating flange at stations where routine visits are made. By closing the voltmeter circuit the station operator can observe the potential difference between the buried protected line and the station line which serves as an arbitrary reference electrode. This value may be correlated with pipe-to-soil potentials by survey.

Readings are taken on regular visits, daily or weekly. One good system of reporting is by filling out a post card form which is mailed to the corrosion engineer.

The method serves as an "alarm" to tell the corrosion engineer that something is wrong. Investigation then follows to learn what.





Plug Leaks With Plastic Foil

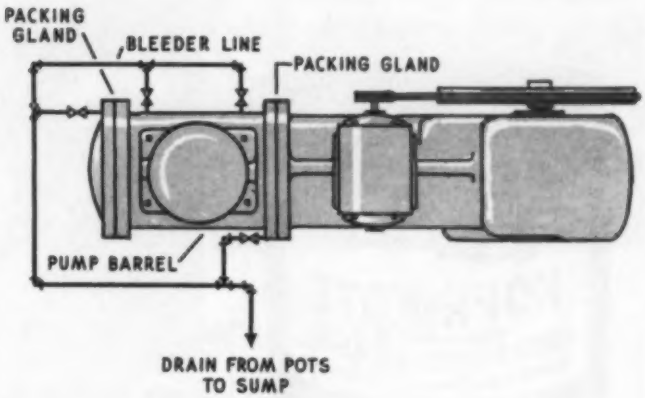
Plastic foil flakes, originally manufactured to prevent lost circulation in drilling wells, have been successfully applied in stopping leaks in oil storage tank bottoms. The contents of one 25-pound bag can cover over a half-million square inches, therefore very little of the material is required in most cases.

The plastic foil flakes are first mixed with a carrying agent, preferably oil from the stock tank. It is desirable to place this mixture as near the area of leaks as possible. Therefore, if the bottom is leaking, it might be necessary to pump into a connection on the drain line. In any event, a pump is necessary in order to place the oil-foil mixture into the tank. If there are no connections near the bottom on which to tie a line, it may be necessary to extend a section of one-inch pipe through the thief hatch on top of the tank. In this manner, discharge of the material through the one-inch line can be directed anywhere on bottom desired.

Previous experience has shown that leaks are not stopped immediately, but that a complete shutoff of a leak is usually obtained in about a week after the plastic flake material has been applied.

Make Drain Lines Self-Cleaning

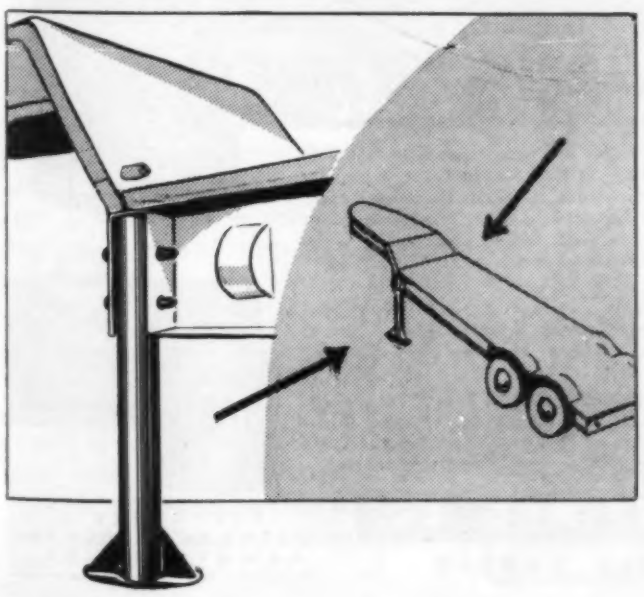
The hookup shown here greatly improves the packing gland drain system for reciprocating pumps. It costs little and enables operators to clean the drain lines with high pressure fluid from the pump. The conventional hookup has the drain line valves upstream from the bleeder valves, and when the line becomes clogged with oil, bugs and dirt, operators must use high pressure air to clean it.



With the bleeder valves ahead of the drain lines, the operator need only close the packing drain valves, open the bleeder valves, and the lines are clear in less than a minute. Once clear they will stay operable for weeks.

Cost of this installation is negligible, since most of the material is usually found on an existing pump. All of the valves and piping are half-inch.

Extra Legs on Lowbed Trailer Make Loading Easier



When necessary to hitch and unhitch from a "lowboy" several times a week, a set of legs attached to the front of the trailer will keep the bed level and make loading easier. Also, the truck tractor can back under the fifth-wheel without lifting the front end off the ground.

The legs, which are detachable, are carried on the bed of the trailer when on the road.

Wells for the legs can be made by cutting out the lower lip of the channel iron beam along the side of the trailer and welding a plate along the back to match the existing plate at the end of the channel iron.

The legs, made from four-inch pipe with plates welded over the lower ends to keep them from sinking into the ground, are set in the wells at the front of the trailer bed. Pins fitted into two holes burned through the frame and pipe with a welding torch keep them steady. When it is time to unhitch the trailer, it is simple to loosen the winch line, disconnect the pin on the front and move off.

JET-LUBE

KOPR-KOTE

THREAD LUBRICANT & SEAL

(U.S. Pat. No. 2,543,741)

THREAD & GASKET ANTI-SEIZE COMPOUND

for Precision Threads, Studs, Nuts, Flanges and Gaskets

Contains copper flake and metallic lead

Provides complete protection against wear and tear—seizure, galling, leakage and corrosion.

For high temperature refinery service—stills, super heaters, headers, hand-hole and man-hole plates, cylinder heads, engines, heat exchangers, valves and pumps.

KOPR-KOTE will remain suspended and not deterioriate, dry out or harden, even when exposed to atmosphere. Impervious to air, water, steam, oils, ammonia and hydrocarbons when made up.

Major Refinery Reports:

"Using KOPR-KOTE extensively on return bends of our furnaces. One man can hot-bolt the whole assembly in less than one day. Previously, one or two men working three days were needed to disassemble using other lubricants. KOPR-KOTE now allows this work to be done by one man in approximately four hours."

Order from your supply house or send for Technical Bulletin

JET-LUBE INC.

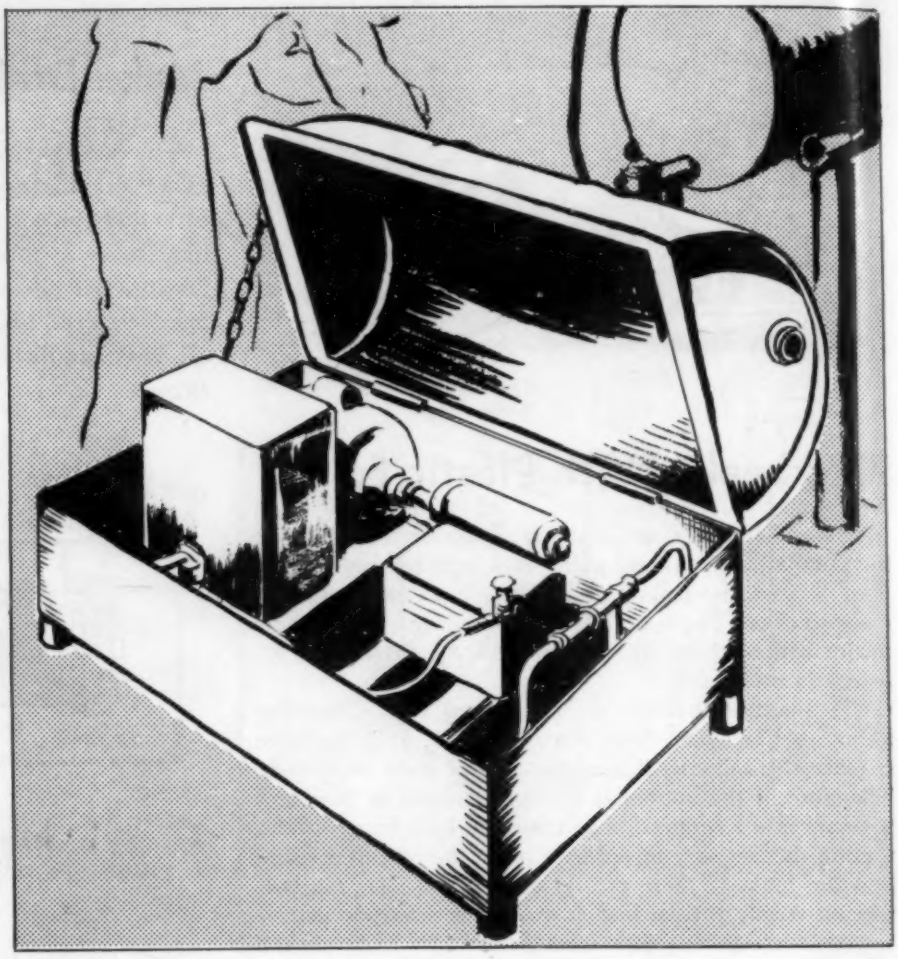
3093 No. California St., Burbank, Calif.

Export Office

30 Rockefeller Plaza, New York 20, N. Y.

Canadian Licensee

Jet-Lube of Canada Ltd., Edmonton, Alberta



Use Scraps to Make Injector Housing

Service life of chemical injectors can be extended appreciably by housing them in all-weather structures. Here is a small field installation that

made for rugged use...

in plant—office or field

Gotkool

water cans and coolers

"GOTKOOL" Water Cans are easily portable for field use . . . and **"GOTKOOL" Water Coolers** are especially designed for use in office, store, or plant. Both have extra large top openings. Snug-fitting, easily removable tops protect water from impurities. Heavy construction with heavy double-locked, sweat-soldered seams. *Buy* **"GOTKOOL"** *at your supply store today.*

GOTKOOL Water Cooler — made in 2, 3, 5, 8, 10, 15, and 20-gallon sizes with extended or recessed flush-mounted faucet optional. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

GOTKOOL Water Can — made in 1½, 2, 3, 5, 10, and 20-gallon sizes without faucets. Extended or recessed flush-mounted faucets available at slight additional cost. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

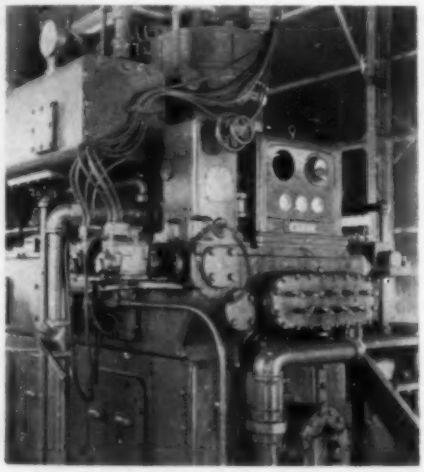
H. P. GOTT MFG. CO.

WINFIELD, KANSAS

KEEP PURE DRINKING WATER ALWAYS HANDY

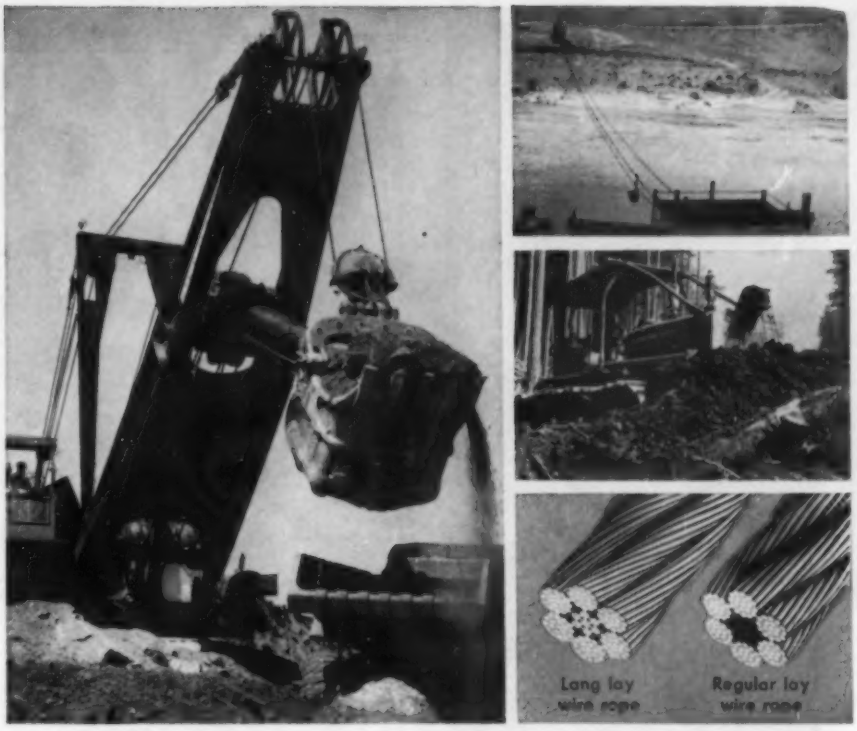
encloses all the essential operating equipment for injecting a corrosive inhibitor into flow lines.

Top of the structure is half of a regular metal oil drum that has been flanged along the edges of the cut as shown. Base of the weatherproof housing is a sheet metal box that serves as a foundation for the chemical supply sump, the pump and an electric motor which powers the pump. The metal box is placed on four short sections of pipe driven into the ground so that the box is approximately level. The semi-circular lid is hinged to one side of the box, and fitted with a chain that supports the lid when opened slightly beyond the 90-degree angle. A drum of inhibitor is located nearby so that filling is simple.



Enlarged Inspection Plate Aids Gas Engine Repair

Whenever disassembly of the gear system in the magneto and governor setup in a gas engine is necessary, repair time can be reduced from one day to two hours. On engines where the cam assembly is visible through an inspection plate, drill holes in the main housing and use a hack saw to cut out a larger plate. Then, by simply taking off the inspection plate, the cam gear can be repaired and disassembly is much easier. Before, it would be necessary to take off all the cam housing, all push rods on the fuel valves and all starting air valves before the cam shaft could be pulled out.



What extra good will Leschen Lang lay wire rope do for you?

Look at a length of Lang lay wire rope. Compare it with regular lay. Notice that the *wires* in Lang lay rope twist in the *same* direction as the *strands*. In regular lay rope these directions are opposite.

What does that do? It makes the exposed length of the outer wires in Lang lay rope about twice as long as in regular lay rope. It has extra bearing surface to withstand wear from scuffing, rubbing and other abrasive action. Also, because Lang lay wires and strands are laid in the same direction, the rope has greater flexibility.

What's the result? Simply this—on some types of duty, where abrasive and bending stresses are abnormal, Leschen Lang lay rope definitely lasts longer than regular lay. Replacements are fewer. Costs are lower. And, with Leschen you are assured of *higher-than-rated quality* for *longer-than-expected wire rope service.*

Can you use these benefits? To make sure, ask your Leschen man. Leschen makes all types of Red-Strand wire rope for all types of jobs, and can help select the best one for you. Perhaps you *should* use Lang lay. Talk to him soon.

Depend on Leschen's higher-than-rated quality for longer-than-expected service.

LESCHEN WIRE ROPE

LESCHEN WIRE ROPE DIVISION
The Watson-Stillman Company
(A SUBSIDIARY OF H. K. PORTER COMPANY, INC.)
St. Louis 12, Missouri

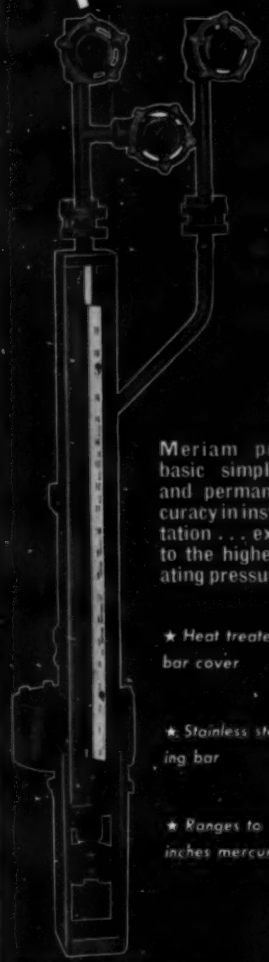
HKP

For more data on advertised products, use Readers' Service Cards, last page.

UNMATCHED ACCURACY

at highest working pressures

At pressures up to 2000 psi, this Meriam Manometer provides critically accurate flow or differential pressure measurement. Constructed of solid bar stock steel, all parts are precision fitted, hand lapped. Each unit is cold hydraulic tested to 5000 psi.



Meriam provides basic simplicity . . . and permanent accuracy in instrumentation . . . extending to the highest operating pressures.

★ Heat treated glass bar cover

★ Stainless steel backing bar

★ Ranges to 70 inches mercury

Write for Bulletin C-12.

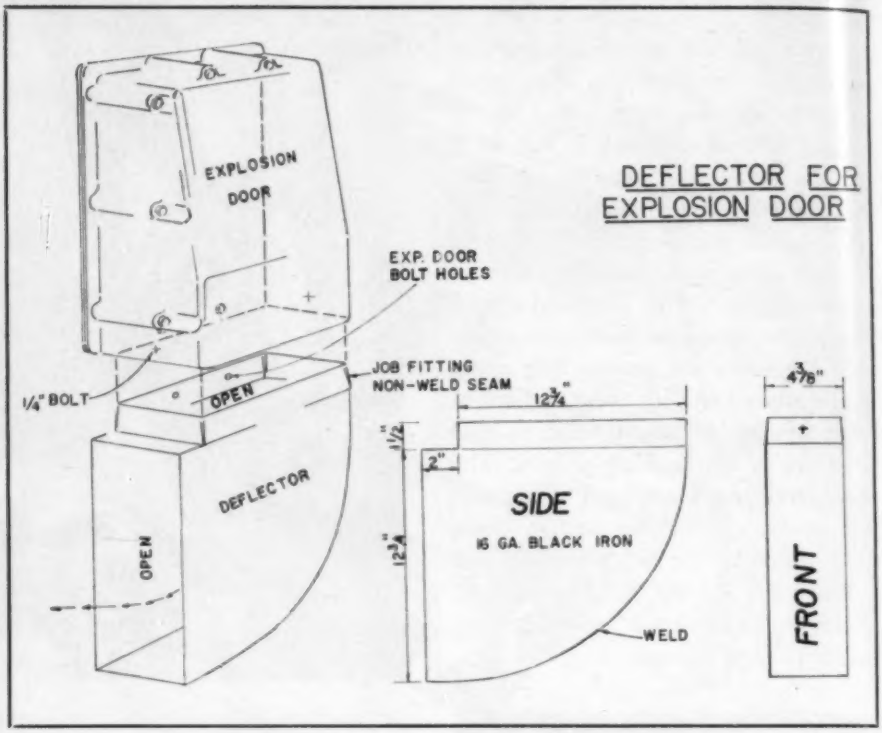
Meriam Manometer Instrumentation

. . . for pressures, vacuums, flows, liquid levels.

meriam

INSTRUMENT COMPANY

10920 Madison Ave. • Cleveland 2, Ohio



Build Deflector for Explosion Door

A compressor engine explosion door deflector is a safety precaution in the event of engine explosions. The deflector can be installed on a compressor engine explosion door nearest the engine controls so that should a crank case explosion occur, the engine can be shut down without the danger of anyone being burned. It also gives protection to men working in the vicinity of the control.

The deflector, installed about eight inches from the floor, curtails oil splashing should there be an explosion.

The deflector is constructed of 10-gage sheet metal. Total cost of the device, including both labor and material, is approximately $8.

Cut Corrosion Costs— specify "CORECO" Cathodic Protection

Stop CORROSION with "CORECO"

• Corrosion Rectifying Company—CORECO—is nationally recognized in the industry for providing the finest type of cathodic protection. CORECO cathodic protection can be **your** best protection against corrosion damage of pipe lines, flow lines, oil well casings, marine installations, etc. Bare or coated lines can be protected from leaks and damage—made to last years longer with CORECO service.

Corrosion Rectifying Company provides complete cathodic protection . . . corrosion surveys . . . soil resistance tests . . . design and installation of rectifier and anode systems . . . a full line of materials for cathodic protection.

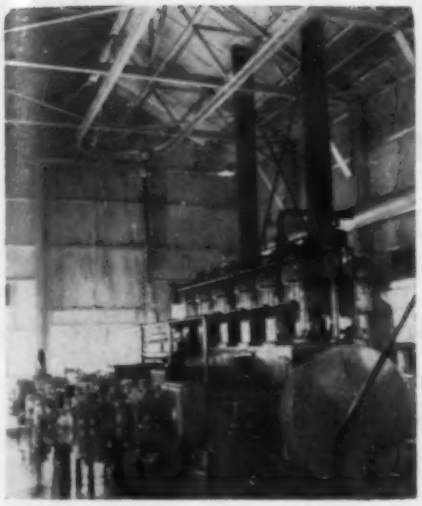
REPRINTS OF TECHNICAL ARTICLES AVAILABLE

☐ "Corrosion Survey Saves $26,000 on 30-mile Line"
☐ "Pipe Line Leaks are not Inevitable"
☐ "Economics of Cathodic Protection"

Check the titles wanted, clip this advertisement, and mail with your name and address to:

CORROSION RECTIFYING COMPANY

1506 ZORA STREET – HOUSTON, TEXAS Phone VA-7522



Double Rail Helps Speed Gas Engine Maintenance

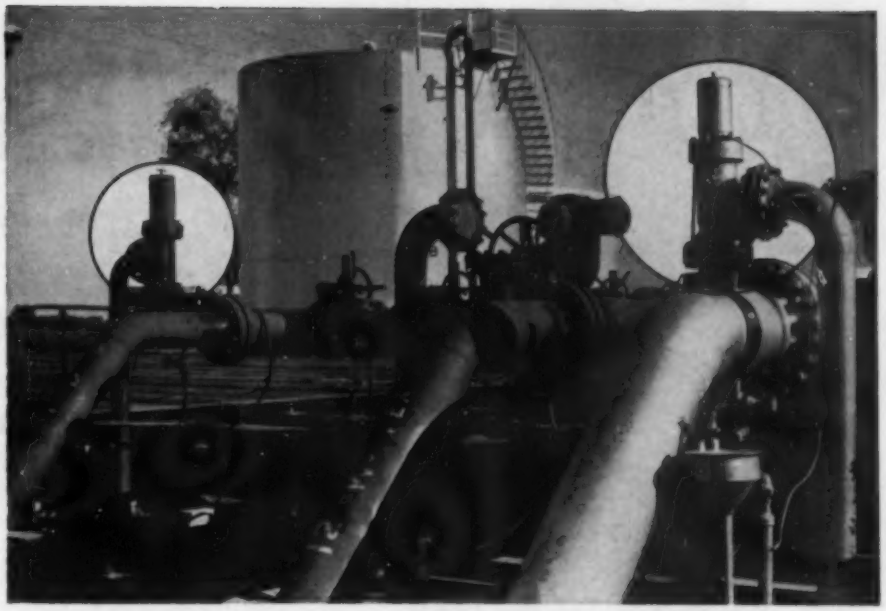
To speed up maintenance on big gas engines, improvise on the monorails found in most compressor buildings. Install a dual rail, as shown above, so that two chain hoists are available and one crew can work at one end of the engine taking off valve heads, while a second crew works unhindered at the other.

Frame-Shaped Ramp Aids Tractor Loading

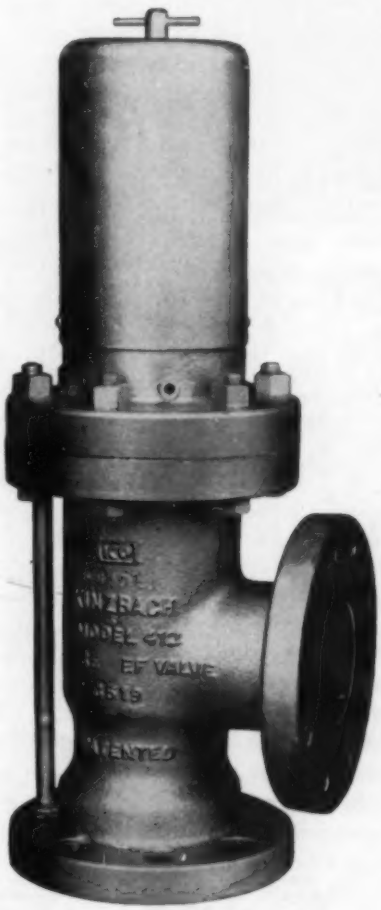
Here is a homemade ramp to facilitate loading of a tractor. The frame is welded solidly to the truck frame except for the lower end which is hinged so it can swing down and rest on the ground.

The upper end is made of four-inch scrap pipe welded up to accommodate the tractor tracks. The well-braced frame is welded securely to the back of the truck frame. Sucker rod pieces are welded across the top of the horizontal track supports to aid traction.

The lower section has two triangular shaped legs with collars welded at the top that slip over the lower member of the upper frame before it is welded.



Positive Protection Against Pressure Surges



KINZBACH
MODEL 412
RELIEF VALVE
for Pipelines and Refineries

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

KINZBACH TOOL CO INC

KINZBACH TOOL COMPANY, INC.

P. O. Box 277 Houston, Texas

Export Office: 74 Trinity Place, New York, N. Y.

For more data on advertised products, use Readers' Service Cards, last page.

Designed for
PROTECTION

Sawyer's "FROG" ® BRAND
CLOTHING

can take it!

Tough — wears like iron, takes endless snagging, scraping, chafing and still gives full protection.
Rotproof — not affected by oils or chemicals — will not blister, crack or peel.

Waterproof — made with top quality base fabric, first saturation-coated, then coated on the inside as well as on the outside with specially blended Neoprene Latex.

Many styles — in black, yellow or Hunter's green
Write for catalog

THE H. M. SAWYER & SON CO.
Cambridge, Mass.

Will Railroads Enter the Pipe Line Business?

They have a valuable asset—right-of-way crossing expensive property and metropolitan areas. As partners in joint ventures, they could regain lost business.

By DONALD M. TAYLOR, Editor, PIPE LINE INDUSTRY

"IF YOU CAN'T beat 'em—join 'em." Southern Pacific Lines, taking this old adage seriously, recently announced plans to construct two products pipe lines at a cost of $30 million. One will run from Los Angeles to Arizona; the other from West Texas to Arizona.

The railroad was faced with the certainty of losing a profitable business it had enjoyed for years—that of hauling gasolines, jet fuels, and diesel fuels from Los Angeles and El Paso refineries to the Phoenix-Tucson area.

The spark for Southern Pacific's move came when several different groups announced tentative plans to lay lines over this route. And since no railroad has competed successfully with pipe lines whose tariffs are less than half that of railroads for such distances, Southern Pacific had to fish or cut bait.

S. P. officials called in Stanford Research Institute to make a market survey, and Bechtel Corporation to assist in planning and constructing the lines. The market is obvious, even to the layman. Arizona has no refineries; the Phoenix-Tucson area is one of the U. S. fastest growing communities. Moreover, Southern Pacific owned right-of-way that had been graded through mountains and valuable crop lands where the cost of easements and crop damage settlements would run high.

Interstate Commerce Commission approval of the project would not be necessary since the line could be laid on the railroad's private property.

Beginning of a trend? This may be the beginning of a trend. For here at last is one railroad company that recognizes that it is in the *transportation business.* Other railroad companies have stood by helplessly while pipe lines and transport trucks helped themselves to the petroleum transportation business. During a time when the tonnage of crude and products transported in the U. S. more than doubled, railroads showed (with the exception of three lush World War II years) a steady decline in tank car shipments. In 1938 when the U. S. transported 354 million tons of crude and products annually, railroads handled 16 percent of the total business. In 1953 when the annual tonnage had risen to 863 million, the railroads handled a mere 5.3 percent.

During this same period, transport trucks increased their share of the business from 5.8 percent to 21.4 percent according to estimates of the Committee for Pipe Line Companies, Washington, D. C.

Yet railroad companies have a valuable asset which makes them a desirable partner for many products pipe line projects. This is the fee-owned right-of-way which requires no easement for a pipe line and pierces virtually every metropolitan area in in the U. S. In most instances bulk stations and many key service stations are located on rail sidings and could be connected easily to cross-country pipe lines through the railroad right-of-way.

Should railroads make right-of-way available to pipe line companies on a profit-sharing basis, the oil companies, pipe line companies, railroads, and consumers would benefit. Automatic dispatching controls are just around the corner, making it possible for pipe lines to serve com-

munities with precision cuts from tenders as they move down the line. This could reduce sharply the percent of products that end up in expensive tank truck hauls before reaching the ultimate consumer.

The savings would run from 5 to 35 cents per barrel of gasoline in most instances. For example, a pipe line can transport 10,000 barrels (420,000 gallons) per day for a distance of 50 miles at about one-eighth the average common carrier truck rate. (See Page 37, August 1954, PIPE LINE INDUSTRY). On short hauls, the saving is somewhat less with the pipe line cost running from 17 percent (for 10,000 barrels per day) to 65 percent (for 1200 barrels) that of the truck rate.

Too, there is the safety hazard. Heavy tank truck traffic makes a dangerous ingredient when stirred into the already congested lanes of city traffic. Following several tragic accidents some cities have limited gasoline truck operation to the before-dawn hours; others have limited their routes to specific streets. Additional pipe lines running only to the central bulk plants could certainly reduce the number of such trucks on the highways and streets, minimizing this hazard.

These factors combine to make the railroads, which have turned deaf ears to a number of joint proposals in the past, logical partners for pipe line companies in many instances. On the other hand such joint ventures would give the railroad companies chances to share in a profitable business likely to be lost to them otherwise.

Southern Pacific plans. In the case of Southern Pacific, no direct tie-in with oil companies has been announced. Through the 10 and 8-inch line which is planned to run from El Paso west to Tucson and Phoenix, the company probably will transport gasoline, jet fuels, and diesel fuels for Standard Oil Company of Texas, The Texas Company, and the McNutt Oil & Refining Company, whose refineries are in the El Paso area.

The second line which will run in the opposite direction from Los Angeles will overlap the first line between Phoenix and Tucson. This pipe line will start as 16-inch and reduce to 12-inch after it passes a distribution point at Coulton, Calif.

IF IT'S WORTH PROTECTING IT'S WORTH PROTECTING WELL

Why risk failure of a well engineered cathodic protection system by using inferior materials?

For positive protection of pipelines and other underground metal structures, use Federated Magnesium Anodes. Note these exclusive features:

- Patented electro-galvanized, spiral wound strip core is completely bonded to the magnesium alloy for perfect electrical contact.
- Full length core assures complete anode consumption.
- Silver soldered, connecting wire joints provide dependable, high-strength low-resistance joints.

Federated makes the widest selection of magnesium anodes in the field. All regular sizes and specifications are available, and special requirements can be met.

A complete line of zinc anodes is also available made from Special High Grade low iron anode zinc.

Corrosion Advisory Service is at your disposal through Federated's 13 plants and 23 sales offices.

Federated Metals

DIVISION OF AMERICAN SMELTING AND REFINING COMPANY
120 BROADWAY, NEW YORK 5, N. Y.
IN CANADA: FEDERATED METALS CANADA, LTD., TORONTO AND MONTREAL
ALUMINUM, MAGNESIUM, BABBITTS, BRASS, BRONZE, ANODES, ZINC DUST
DIE CASTING METALS, LEAD AND LEAD PRODUCTS, SOLDERS, TYPE METALS

Federated — first in the non-ferrous field — FMD

EVERYTHING

for your corrosion protection problems

AN-SPEC Magnesium Anodes

Prepared Backfill

Anodes for Emulsion Treaters & Heat Exchangers

Field-Proven Rectifiers

Holloway Shunts

Agra Test Instruments

National Ground Anodes

National Carbon BF3 Backfill

Coke Breeze 98% Graded ⅜ Down

Complete Cadweld Equipment

Copper Sulphate Electrodes

Complete Engineering Service

- SURVEYING
- ENGINEERING
- INSTALLATION
- MAINTENANCE

MANUFACTURERS OF —

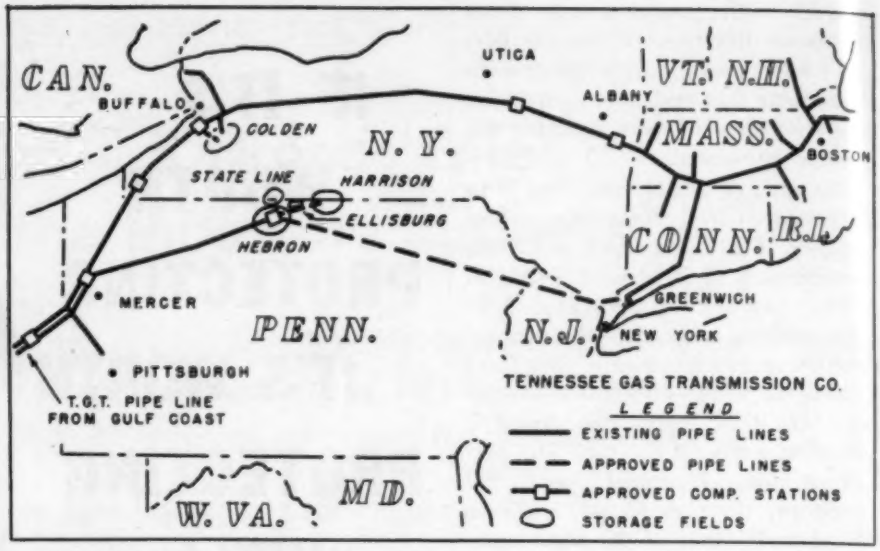
AN-SPEC

HIGH QUALITY ANODES

PIPE LINE ANODE CORPORATION

P. O. BOX 996 PHONE 4-2375

TULSA, OKLAHOMA



CONSTRUCTION TO START about May 1 on TGT's 24-inch Hebron-Greenwich line. This 1000-mile loop will serve New York-northern New Jersey area.

731 Miles of New Line Included In TGT 1955 Construction Program

Tennessee Gas Transmission Company of Houston plans a major construction program in 1955 that includes laying 731 miles of large diameter pipe line in Pennsylvania, New Jersey, New York, Ohio, Louisiana and Texas, construction of two new compressor stations and enlargement of four existing stations.

Key project is an approved 248-mile extension of 24-inch line from TGT's Hebron Storage field in Pennsylvania across New Jersey and New York to Greenwich, Conn. Construction will begin about May 1, announce company officials. When completed the line will serve principally the New York City-Northern New Jersey metropolitan area delivering 75,000 Mcf per day to four gas utilities.

The line will, in effect, complete a 1000-mile "loop" from Mercer, Penn., to Greenwich, Conn., where it connects with the south end of the company's New England pipe line system. Tied in with the loop are three underground storage fields in Pennsylvania and New York, also authorized by the FPC.

TGT also announced that it has filed application with the FPC for authority to construct a 370-mile, 30-inch natural gas pipe line from near Agua Dulce, Texas, along the Gulf Coast to a terminal near Kinder, La. The $35,400,000 line will be capable of carrying 270,000 Mcf per day. Running parallel to and

SAND BANUM

Headquarters for

Corrosion — Scale — Rust Control

SAND-BANUM
for Boilers

•

SAND-BANUM SPECIAL
for Radiator Cooling Systems

•

SABANOL
for Clean Fuel Oil Burnability

•

RUSTEND
for Metal and Metal Surfaces

•

SABCO
Double Duty Aluminum Paint

•

Write for Data on Any or All — Stocked by Leading Supply Houses

AMERICAN SAND-BANUM CO., Inc.
Established 1926
Meadowbrook National Bank Bldg.
FREEPORT, NEW YORK

near the Gulf Coast line, the line will pass through an important part of the Gulf Coast supply area, making supplies available from fields on shore and from the offshore tidelands under exploration.

This new line will be built in substitution for pipe line and compressor facilities previously authorized by FPC along TGT's main system from Agua Dulce to Natchitoches, La.

TGT also plans construction of 36 miles of 26-inch line to parallel the existing system in Ohio. A new 19-mile spur of 24-inch will be built from the Hebron Storage field compressor station to the newly authorized Harrison Storage field nearby.

Construction of a new 5500-horsepower station near Isola, Miss., is underway. A second new station having 13,400 h.p. will be constructed near Morehead, Ky. Plans call for building to start about April 1. Four existing stations will be enlarged. Included in this program are those at Winchester, Ky., Albany, Ohio, Coudersport, Penn., and Hamburg, N. Y.

Texas-New Mexico Awards Contract for 18-Mile Line

Holder Construction Company of Snyder, Texas, has been awarded the contract for construction of 18 miles of gathering line extensions in Borden County, Texas, for Texas-New Mexico Pipe Line Company.

The new lines, including ten miles of eight-inch, will extend from Good field to Jo-Mill Spraberry field. Work is under way.

Trans-Mountain to Build Spur Line to Washington

Trans-Mountain Oil Pipe Line Company of Vancouver, B. C., plans construction of a 36.5 mile spur line into Washington. The project, costing $2,750,000, will include a 27.5-mile extension of its 20-inch spur from Laurel to Burlington, Wash., and nine miles of 16-inch lateral line to connect with the Shell Oil Refinery being constructed near Anacortes, Wash.

Construction is being handled by Engineers Limited Pipeline Company.

Clinchfield Coal Corp. Planning 16-Mile Gas Line

Clinchfield Coal Corporation of Dante, Va., has asked for FPC authority to build a 16-mile, 12-inch line from fields in Dickenson County, Va., to Kentucky-West Virginia Gas Company connections near Osborne

Newport Steel LINE PIPE
PROVES ITSELF IN THE GROUND

NEW PIPE SERVICE
To expedite delivery throughout the entire area, Newport now maintains representative sizes and weights in their Houston depot.

The steel that goes into Newport's electric weld line pipe is a quality product from electric furnaces. Careful control of analysis and rolling improves the characteristics of the hot-rolled strip used in our electric weld process. This 4" and 6" pipe is available in standard walls, also in thin walls for maximum economy; exceeds the most rigid requirements of API and ASTM specifications. Welds easily in the field, gives long and satisfactory service. For quality and excellent service, contact Newport Steel before you buy line pipe or any other of the products listed below.

SIZES AND WEIGHTS AVAILABLE

O.D.	Wall	Wt. Per Ft.
4½	.125"	5.84
	.142"	6.61
	.156"	7.25
	.188"	8.64
	.219"	10.00
	.237"	10.79
6⅝	.134"	9.29
	.156"	10.78
	.188"	12.89
	.219"	14.97
	.250"	17.02
	.280"	18.97

NEWPORT PRODUCTS
Cold-Rolled Sheets
Hot-Rolled Steel in Coil
Hot-Rolled Pickled Steel in Coil
Hot-Rolled Sheets
Hot-Rolled Pickled Sheets
Galvanized Sheets
Galvannealed Sheets
Colorbond Sheets
Electrical Sheets
Alloy Sheets and Plates
Electric Weld Line Pipe
Roofing and Siding
Eave Trough and Conductor Pipe
Culverts

ECONOMICAL WATERAIL DELIVERY
Newport Steel is situated on the Mississippi-Ohio River system and the great Cincinnati rail hub. With the advantage of location, new river barge facilities and seven major railroads, Newport gives economical, dependable delivery to the entire area of the Middle West and South.

Newport Steel CORPORATION
NEWPORT, KENTUCKY
YOUR CONFIDENCE IS JUSTIFIED WHERE THIS FLAG FLIES
A SUBSIDIARY OF MERRITT-CHAPMAN & SCOTT CORPORATION

Gap, Ky. Clinchfield first asks FPC to disclaim jurisdiction, but in the alternative asks a certificate authorizing construction and operation of the line.

Estimated cost of the proposed line is $785,000. Clinchfield has contracted with Kentucky-West Virginia to deliver 12,500 Mcf per day. Line design calls for capacity of 16,010 Mcf per day.

Cherokee Will Construct Four Products Terminals

Cherokee Pipe Line Company has announced plans for constructing four petroleum products terminals to handle added capacity of its new pipe line facilities. Sites for the terminals are Oklahoma City, Mount Vernon, Mo., Wood River, Ill., and Wichita. Total cost of construction will be an estimated $3 million.

Work is already underway at Mount Vernon, Wood River, and Wichita. Construction is scheduled to start at Oklahoma City in a few weeks. Plans call for all terminals to be completed this spring.

Storage capacity at Oklahoma City will be 50,000 barrels; at Mount Vernon, 150,000 barrels; at Wood River, 830,000 barrels and at Wichita, 110,000 barrels.

Pipe Line Contracts Not Let

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alabama-Tennessee Natural Gas Co.—Florence, Ala.	25	8, 12	Gas	Alabama	$808,450	3.7 miles authorized
Alberta Gas Trunkline Co., Ltd.	315	18-36	Gas	Alberta Fields—Trans-Canada Terminal on Alberta-Sask. boundary	$37 million	Planned
American Louisiana Pipe Line Co.—666 Penobscot Bldg., Detroit, Mich.	1,289	22, 30	Gas	North Tepetate, La.—Detroit, Mich.	$130 million	1,172 miles conditionally authorized
American Pipe Line Corp.—New York City (Swinerton & Walberg, Engineering)	1,425 plus 485 miles feeders & distribution lines	24, 26	Products	Beaumont, Texas area—Newark, N.J.	$170 million	Planned
Anadarko Basin Pipe Line Co.	525	24	Gas	Wise County, Texas—Texas Eastern near Memphis, Tenn.	.....	Planned
Arkansas-Louisiana Gas Co.	136	....	Gas	Arkansas, Louisiana and Texas	$9,245,166	Approved
Ar-Mex Pipe Line Co.	900	8, 12, 14	Crude	Guernsey, Wyo.—Phoenix, Ariz.	$31 million	Planned
Attock Oil Co.	60	....	Gas	Dhulian Field—Rawalpindi, West Pakistan	.....	Planned
California-Oregon Pipe Line System	103	6	Crude	Crescent City, Calif.—Medford, Ore.	$2 million	Planned
Carolina Natural Gas Corp.—701 Wilder Bldg., Charlotte, N.C.	185	2, 12	Gas	North and South Carolina	.....	Proposed
Central Hudson Gas & Electric Co.	48	12	Gas	Albany—Kingston, N.Y.	.....	Applied to FPC
Cities Service Gas Co.—1st National Bank Bldg., Oklahoma City, Okla.	33	20, 26	Gas	To replace lines in Kansas and Missouri	$1,800,000	Authorized
	13	....	Gas	Labette County, Kansas	$285,000	Authorized
	15.5	16	Gas	Carter County—Garvin County, Okla.	$541,050	Authorized
	11.5	2, 4, 8	Gas	Johnson and Cass Counties, Mo.	$140,000	Before FPC

Continued on Page 96

H. B. ZACHRY CO.

General Contractors

PIPE LINE DEPARTMENT TRANSIT TOWER
SAN ANTONIO, TEXAS
Phone: CApitol 6-2472

Skill, Integrity and Responsibility

Constructors of

PIPE LINES

Oil Field Stations Electrical Installations

STANDARD OF THE INDUSTRY . . . for cutting steel or cast iron pipe . . .

THE **ALSTON** *Rachet* **PIPE CUTTER**

There's none better for SPEED, SAFETY, POWER, ACCURACY and ECONOMY. It eliminates dangerous sparks . . . broken cutters; rollers hold pipe taut after cutting. It's easy on and off pipe . . . will cut 10" pipe in 12 min. Patented roller guides. Rachet makes it easy to work in close places.

A size for every requirement . . . write for details, literature and prices.

ALSTON MANUFACTURING COMPANY
P. O. Box 707 Phone 226
LIVINGSTON, TEXAS

How to Get MILES AHEAD on Pipeline Jobs

From Maine to Mexico, pipeliners find that spreads move faster when the tough trench assignments are handled by Bucyrus-Erie excavators. Individual Design is one of the big reasons why. With each model in the line designed as an entirely separate model, Bucyrus-Eries are right for their work . . . have the right combination of capacity, strength, speed, and smoothness to deliver profit-making output on the toughest trenching jobs.

Take your digging problems to your Bucyrus-Erie excavator distributor — he'll show you how you, too, can get miles ahead with Bucyrus-Eries. 45E54

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

For more data on advertised products, use Readers' Service Cards, last page.

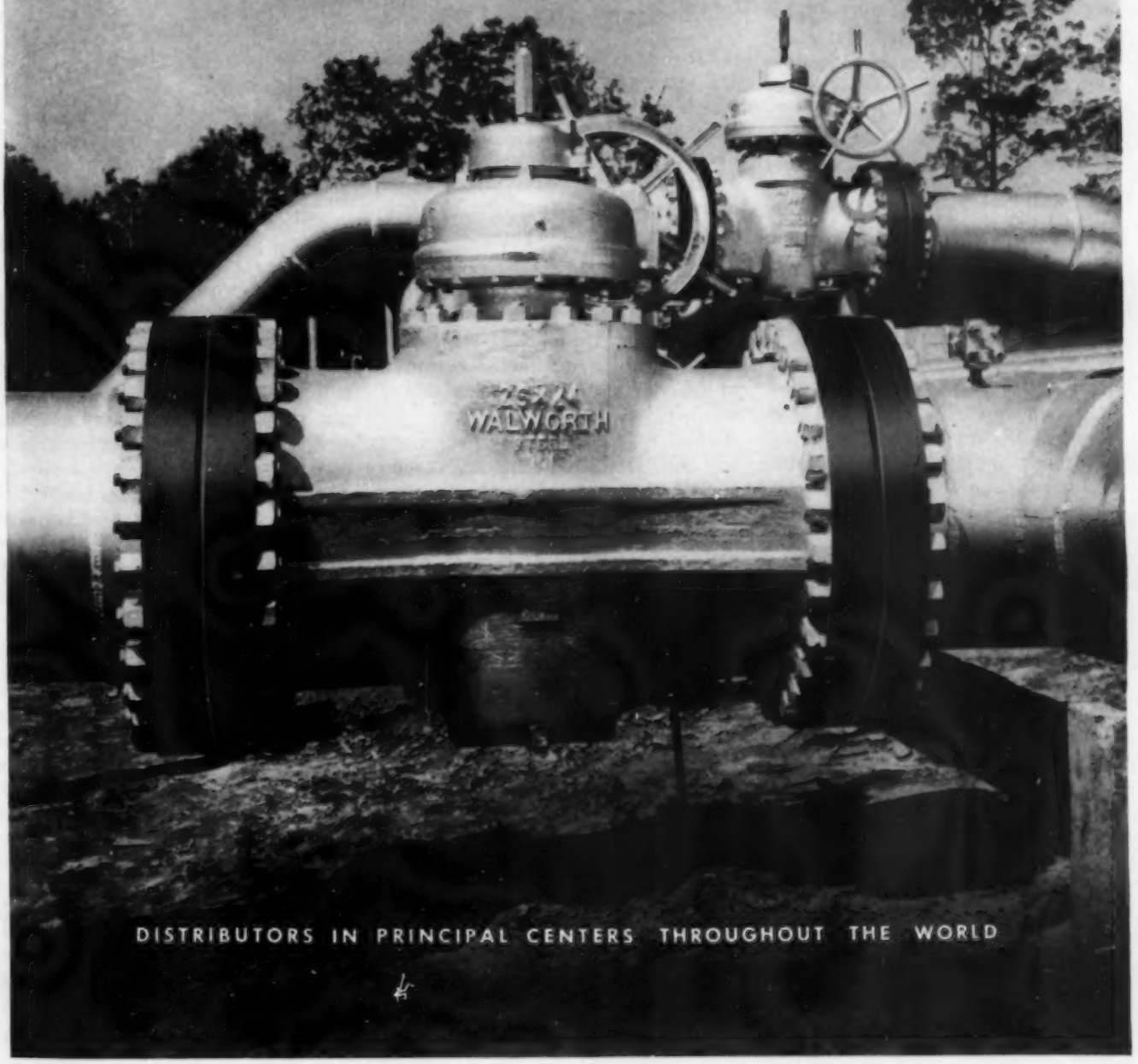
Pipe Line Contracts Not Let—(Continued)

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
City of Dalton, Ga.	30	8	Gas	To connect with Southern Natural Gas Co. line	$2,940,000	Proposed
Clinchfield Coal Corp.—Dante, Va.	16	12	Gas	Dickenson County, Va.—Osborne Gap, Ky.	$785,000	Before FPC
Coast Counties Gas & Electric Co.—369 Pine St., San Francisco	40	3, 4, 8	Gas	Coast and Valley region, Calif.	.....	Planned
Colorado Interstate Gas Co.	365	22	Gas	Rock Springs, Wyo.—Denver, Colo.	$23,299,000	Authorized
	115	4, 6, 8	Gas	Denver—Julesburg Basin—Basin Cities	.....	Before FPC
Colorado Western Pipe Line Co.—Dallas	708	....	Gas	Southeastern Colorado fields—Denver, plus laterals	$30 million	Planned
	328	16, 18	Gas	LaPlata County—Pueblo, Colorado Springs and Denver	$21,600,000	Authorized
Compania del Oleoducto Buenaventura—Cali, Colombia, S.A.	90	....	Products	Buenaventura—Cali, Colombia, S.A.	$4 million	Planned
Consolidated Gathering Systems, Ltd.	198	....	Crude	Sturgeon Field—Edmonton.	.....	Planned
Dixie Pipe Line Co.	20	8	Gas	Gwinville Field, Miss.—Transcontinental Gas line	$425,000	Proposed
El Paso Natural Gas Co.—El Paso, Tex.	32.5	10	Gas	Reagan and Upton counties, Texas	$799,000	Authorized
	74	....	Gas	Texas, New Mexico and Arizona	$13,800.00	Authorized
	370	....	Gas	Mountain Home, Idaho—Reno, Nev.	$35 million	Proposed
Empresa Nacional del Petroleo	60	6	Products	Concon—Santiago, Chile	.....	Planned
Governments of Southern Rhodesia and Portuguese South Africa	200	....	Products	Beria, Portuguese Mozambique—Umtalia, Southern Rhodesia	.....	Considered
Hope Natural Gas Co.—445 W. Main St., Clarksburg, W. Va.	33	8, 10, 12	Gas	Wyoming County, W. Va.—Buchanan County, Va.	.....	Proposed
Houston Texas Gas & Oil Co.—4604 Main St., Houston	1,542	Various	Gas	Louisiana—Florida	$148 million	Proposed
Idaho Natural Gas Co.—Goodland, Kansas	....	....	Gas	Pacific Northwest line—points in Southern Idaho	.....	Proposed
International Pipe Line Co., Inc.—227 N. Colfax Ave., Minneapolis, Minn.	132	8	Products	Wrenshall, Minn.—Minneapolis Bulk Terminal	$4,250,000	Planned
Kansas-Nebraska Natural Gas Co.—Phillipsburg, Kansas	283	6-12	Gas	Central and northeast Nebraska	$4,096,890	Some contracts let
Kentucky-West Virginia Gas Co.	32	12	Gas	Service line to Maytown, Ky.	.....	Before FPC
Lateral Gas Pipe Line Co.—Cedar Rapids, Iowa	27	4	Gas	Grant—Clarinda, Iowa	$267,000	Proposed
Maleo Pipe Line, Inc.	91	6	Products	Prewitt, N.M.—Albuquerque	$1,250,000	Planned
Mayflower Pipe Line Co.-(Pine Tree Natural Gas Co.) —70 Pine St., New York, N.Y.	200	....	Products	New Jersey refining area—New England	.....	Planned
Michigan Consolidated Gas Co.—415 Clifford, Detroit	25.5	12	Gas	Sparta—Muskegon, Mich.	$13 million	Proposed
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	252	4-24	Gas	Wisconsin	$11 million	Proposed
Missouri Central Gas Co.	25	6	Gas	Moberly—Macon, Mo.	.....	Proposed
Missouri Public Service Co.—Warrensburg, Mo.	136.4	8-10	Gas	New Franklin, Mo.—Grundy County, plus laterals	$5 million	Proposed
Montana-Dakota Utilities Co.—Minneapolis.	56	2, 4, 6	Gas	Hettinger and Stark counties, N.D.	$728,854	Authorized
Moore-Stoner Co.	200	6	Products	Glendive, Mont.—Minot, N.D.	$2,000,000	Planned
NATO	1920	4-10	Products	To serve military bases in Western Europe	.....	Foster-Wheeler Prime Contractors
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	479	20, 26	Gas	Wise County, Texas—Fritch	$32,070,000	Before FPC
Natural Gas Producers, Inc.—Colorado Springs	61.8	12	Gas	Yenter Pool—Denver	$1,374,000	Planned
	49	10	Gas	Denver-Julesburg Basin—Fort Morgan, Brush and Denver	.....	Planned
Nebraska Pipe Line Co.	220	6	Products	Cheyenne, Wyo.—North Platte, Neb.	$4 million	ODM certificate granted
New River Gas Co.	50	....	Gas	Summers-Monroe Counties, W. Va. and Narrows and Dublin, W. Va.	.....	Planned
NNCW Pipe Pine Co.—Dallas, Texas	127	8, 10	Crude	Clareton Field—Casper, Wyo.	$3.6 million	Planned
North Dakota Natural Gas Co.—St. Paul, Minn.	500	6, 10, 12	Gas	Tioga-Minot, Fessenden, Devils Lake and Fargo, N.D., plus 6" feeder lines	$10.8 million	Proposed
Northern Indiana Fuel & Light Co.—Auburn, Ind.	35	10	Gas	Edgerton—Auburn, Ind.	$876,814	Planned
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Duluth, Minn. and Superior, Wis.	$12 million	Before FPC
	329	2, 12	Gas	Sioux Falls to Aberdeen, S.D.	$6,661,100	Proposed
	310	24	Gas	Tioga to Fargo, N.D.	$18,494,000	Planned
	....	....	Gas	To interconnect with Natural Gas Pipe Line	$244,000	Planned
	403	24, 30	Gas	Emerson, Manitoba, Canada—Farmington, Minn.	$32,813,000	Before FPC
Northwestern Utilities, Ltd.—10124-104th St., Edmonton, Alberta, Canada	42	12	Gas	Bonnie Glen—Edmonton, Alberta	$1.4 million	Proposed
Pacific Northwest Pipe Line Corp.—M&M Bldg., Houston	1466 plus 443	Various	Gas	San Juan Basin—Pacific Northwestern states	$163 million	Approved
Pawnee Pipe Line Co.	15	8	Crude	Northeast Colorado Sector—Denver-Julesburg, Basin	.....	Planned
Permian Basin Pipe Line Co.	11	6	Gas	Lea County, N.M.	.....	Before FPC
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juarez, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	260	6, 8	Products	Lagos, Mexico—Guadalajara, Aguascalientes and Salamanca	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
	72	12	Crude	Poza Rica—Atzacapotzalco, Mexico	.....	Proposed
Phillips Petroleum Co.—Bartlesville	54	6	Products	Goldsmith—Borger, Texas	.....	Planned
Santos Jundiai Railway Co.—Brasil	....	8, 14, 22	Crude & Products	Expansion of Santos—Sao Paulo system	$5 million	Planned
Shell Oil Co. and Murphy Co.	450	16	Crude	Eastern Montana Williston Basin—Guernsey and Fort Laramie, Wyo.	.....	Proposed
Shenandoah Gas Co.—Lynchburg, Va.	40	3, 4, 8	Gas	Virginia Gas Transmission Co. System—Virginia and West Virginia towns	$1,470,000	Authorized
Sioux Oil Co.	50	....	Products	Newcastle, Wyo.—Rapid City, N.D.	$1 million	Planned
Southern Pacific Pipe Lines, Inc., Los Angeles	....	8-16	Products	Los Angeles—El Paso	$30 million	Planned
Sturgeon Pipe Line, Ltd.	100	12	.....	Sturgeon Lake Field—Trans-Mountain system	$6,500,000	Planned
Sunflower Pipe Line Co.—Tulsa, Okla.	265	3-6	Products	Kearny, Grant and Haskel Counties, Kansas—Wichita, Kansas	$3.5 million	Authorized
Tennessee Gas Transmission Co.—Box 2511, Houston	248	24	Gas	Hebron Storage Field, Pa.—Greenwich, Conn.	$28,700,000	Authorized
	370	30	Gas	Agua Dulce, Texas—Kinder, La.	$35.4 million	Before FPC
	36	26	Gas	Ohio Loop	.....	Planned
	19	24	Gas	Hebron, Pa., Storage—Harrison, Pa., Storage	.....	Planned
Texaco-Cities Service Pipe Line Co.	45	8	Products	West Tulsa—Cushing, Okla.	.....	Planned
Texas Eastern Transmission Corp.—Texas Eastern Bldg., Shreveport, La.	481	16, 24, 26	Products	Reconvert "Little Big Inch" line and construct 382 miles of additional line	$7,114,000	Proposed
Texas Gas Transmission Co.—416 W. 3rd St., Owensboro, Ky.	81	20, 26	Gas	Looping portion of Louisiana-Tennessee Line plus 100 miles smaller lines in Southern Indiana	$17.5 million	Proposed
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta	2240	30, 36	Gas	Alberta—Eastern Canada	$297 million	Approved
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston	....	....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	361.5	30, 36	Gas	Paralleling portions of Texas-New York line	$48,205,000	173 miles authorized plus 58 miles of 12 and 16-inch line
Triangle Pipe Line Co.	360	12	Products	Arkansas City, Ark.—Covington, Ky.	$24.5 million	Proposed
Union Oil Co. of Canada, Ltd.—Chatham, Ontario	180	24	Gas	Dawn Gas Field to Lamberton County to deliver gas to Dominion Gas Co.	.....	Planned
United Fuel Gas Co.	13	12, 20	.....	West Virginia	.....	Before FPC
U. S. Navy	600	10	Products	Rota—Zaragoza, Spain	$40 million	Planned
	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Utah Natural Gas Co.	40	16	Gas	Orem—Salt Lake City, Utah	.....	Planned
Virginia Natural Gas Co.	153	....	Gas	Buckingham—Richmond and Portsmouth, Va.	.....	Planned
West Coast Pipe Line Co.—Mercantile Bank Bldg., Dallas	960	24, 26	Crude	Wink, Texas—Norwalk, Calif.	$106 million	Planned
Westcoast Transmission Company, Ltd.	650	30	Gas	Peace River Fields—Sumas, Wash.	$140 million	Proposed
	....	30	Gas	Peace River Fields—Okanagan Valley	.....	Proposed
Winnipeg and Central Gas Co.	450	4-8	Products	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned
Wyoming Gas Products Corp.	....	....	Gas	Gathering system in Weston County, Wyo. to feed gasoline plant	.....	Planned
Yacimientos Petroliferos Fiscales Bolivianos	170	4	Crude	Bermejo—Tupinza, Bolivia	.....	Planned

LUBRICATED PLUG VALVES by WALWORTH

Two Walworth Cast Steel Lubricated Plug Valves in use on the main line of a southeastern gas pipeline.

In addition to Lubricated Plug Valves, Walworth manufactures Gate, Globe, Angle, and Check Valves in a wide range of types and sizes for the oil and gas industries. Walworth Company, General Offices, 60 East 42nd Street, New York 17, N. Y.



DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

For more data on advertised products, use Readers' Service Cards, last page.

PIPE LINE INDUSTRY'S VIEWS OF THE NEWS

HEADLINES OF THE MONTH

• President's Cabinet Committee wants Gas Act amendment . . . • Industry's message reaches people . . . • Independents lose House imports skirmish but keep hopes . . . • Fight for crude markets grows hotter . . . • Steel outlook satisfactory.

Chances of removing independent producers from FPC jurisdiction were brightened at month's end by the long-awaited recommendation of President Eisenhower's Cabinet Committee on Fuels.

The committee urged that production and conservation of gas be regulated by state agencies. Interstate transmission would continue under FPC control, and distribution under public utility commissions.

Reaction to the Committee report was that it would set in motion the legislative machinery which has been stalled for lack of a driver. Though several bills to amend the Natural Gas Act have tumbled into the congressional hopper, neither of the major parties has been eager to go it alone on an issue so touchy in many consumer states. The Committee report, being a bipartisan instrument, goes far toward lifting the cause out of the political realm.

Just how important the favorable recommendation was to the success of the bill was attested by an earlier statement from Speaker Sam Rayburn. In effect, he declared that Congress could not act with success until the recommendations were received.

An aide to Senate Democratic Leader Lyndon Johnson, long a stout proponent of a Gas Act Amendment, said the senator believed the Committee's recommendation will open the way for quick passage of a bill exempting independent gas producers from federal regulation.

A statement from Sen. Estes Kefauver of Tennessee explained the general reluctance to push the measure without the backing of the Cabinet Committee. Said he: "This means consumers had better get ready for more millions on their gas bills."

Kefauver called the proposed policy "far worse" than the Kerr Bill which was vetoed by President Truman. "The White House policy statement simply sacrifices the interests of some 30 million consumers who depend on natural gas to the profits of a comparative handful of oil companies which produce it."

New Gas Tactic Pays Off

"It is hard to believe that Congress will ignore the record of an industry which has increased its customers by millions within a single decade, while keeping the ultimate cost low during a period of inflationary prices. What more could be accomplished by federal regulation of this business is hard to imagine . . ."

This paragraph in *The Saturday Evening Post* last month was heartening new evidence that industry has at long last chosen an effective approach to the once seemingly hopeless task of rectifying the Natural Gas Act.

Until recent months the approach was one of trial and error, and a time of trial and error it indeed was.

Until 1950 the accepted approach was in the name of Justice. The everlasting futility of this route became manifest when an uproar from the misinformed daily press panicked President Truman into vetoing the Kerr Bill.

Next the industry tried Logic and was frustrated by the Supreme Court, whose myopic views on the case were admitted by one of its members, Justice Douglas, who declared in a dissenting opinion that the problem "involves considerations of which we know little and with which we are not competent to deal."

And now at last, having tried the case in the Congress, the press, and the courts, industry is going directly to the people, and with arguments containing less misty idealism and more dollars-and-cents realism. Complaints that the noose of FPC control is throttling the industry are deemphasized in favor of warnings that the public's gullet is also being encircled. Arguments like those cited by Paul Kayser, president of El Paso Natural Gas Company, before the National Editorial Association, are being hammered into the public consciousness. Federal regulation of gas prices, said Kayser, will:

> ". . . Inevitably restrict exploration and reduce the amount of gas available for consumers' demands." (Thus, you, the public, will pay more for gas.) ". . . Lead to the regulation of other competing fuels such as oil and coal, as well as other commodities like lumber, wheat and cotton." (Thus, you, the public, will next be regulated.)

The editorial in the *Post,* one of the nation's great consumer magazines, can mean only that industry is at last awakening response at the grass roots level.

The *Post* commented further: "The Supreme Court's decision of last year will certainly produce a new battle in Washington. It will be unfortunate if the debate becomes so intense that the basic principles involved are generally ignored. One of these certainly is that any move to impose regulation on an American industry should be supported by substantial evidence that a need for regulation exists and that the measures sought are consistent with the operation of a free economy."

Democrats Planning Probe

Bruised bystanders at the party-line brawls in this closely-divided Congress are due to receive some new bumps from an investigation of the House Small Business Committee.

Controlled by Democrats and eager

to plaster the "big business" label On the Republican Administration, the group plans probes of several industries, oil among them.

The head of the Federal Trade Commission will be called in to answer complaints that his agency has been lax in protecting small business.

The Federal Power Commission will be asked to justify rate increases allowed gas pipe line companies, and why the delay in imposing regulation on independent gas producers.

A subcommittee on manufacturing and distribution will look into complaints of gasoline dealers concerning "unreasonable" lease renewals.

Politics on the Highways

More Congressional politicking was swirling around the President's $101 billion road program.

Apparently to prevent the Republicans from grabbing off credit for an improved 40,000 miles of interstate highways, the Democrats rushed in with a bill authorizing $16 billion for highway construction in the next five years.

The President's plan is to pay much of the government's $31 billion share (the states would pay the other $70 billion) with 30-year bonds. The Democrats would pay for their program with pay-as-you-go, designed to be less offensive to voters.

New Job for Jack Knight?

Advancement of AFL-CIO merger plans by leaders last month at Miami heightened the opinion that O. A. (Jack) Knight, president of the Oil Workers International Union—CIO, will be one of the top vice presidents when the new 15 million-man combine goes into operation, perhaps in 1956.

The unity agreement calls for 27 vice presidents, with ten from the CIO. Knight is the senior officer in the CIO unions now connected with the petroleum industry, and at month's end he was slated to take over the presidency of the International Oil & Chemical Workers Union—CIO. This was the label for the union which was to result from the Cleveland merger of the OWIU and the United Gas, Coke & Chemical Workers Union-CIO.

The projected merger of the AFL-CIO, said Knight last month, will bring no immediate change in collective bargaining relaitonships of present unions and their companies.

Imports Fight to Senate

Independent producers lost a fight but kept their hopes last month in the Congressional imports struggle.

The fight was lost when the Ike-liked extension of the Reciprocal Trade Agreements Act cleared the House without amendments requiring imports curbs.

The hopes were bolstered when the President's Cabinet Committee on Fuels recommended that limits be placed on imports. Senator Price Daniel of Texas announced he would introduce a bill limiting imports to 10 percent of domestic production. That would be slightly lower than the limit recommended by the committee.

Even without the support of the Cabinet Committee's report, the independents had hoped to plaster the Trade Agreements Act with amendments in the Senate.

The House conflist over the issue was unexpectedly close, would have been closer save for some quick and canny maneuvering by Speaker Sam Rayburn, oil-state Democrat stubbornly intent on hewing to the bipartisan line.

The independents and their allies, notably coal, were brushed aside in the House Ways and Means Committee, which reported out the Act with no quota restrictions by a vote of 20 to 5.

The first vote on the floor was on whether to end discussion of the closed rule proposal to bar amendments. It was here that the independents scored a 206-178 victory that brought Rayburn into action. The Speaker drove a wedge into the protectionist group by warning that "you may get your amendment adopted, but then you will feel compelled to vote for a bill on final passage, although it will contain many other amendments to which you seriously object."

The President rushed in with a statement that he would very much deplore seeing the nation going backward to establishment of legislative quotas.

Thus coaxed into line, the House voted 193 to 191 against a motion to open the measure to amendment. The House then approved the closed rule, 193 to 192.

An amendment pushed hard by the protectionist group would have required the President to follow Tariff Commission findings in escape clause proceedings unless "national security" demanded otherwise. State Department officials declared this would have tied the President's hands.

States May Raise Gas Tax

Agitation is sweeping a number of states to raise gasoline taxes.

Texas and North Dakota would join a select group of states now imposing 7 cents a gallon. Opposition to the hikes is developing.

A map issued by the Mid-Continent Oil & Gas Association shows the breakdown by cents per gallon tax:

7 cents—Florida, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina and Tennessee.

6½ cents—Arkansas, Oklahoma, Washington.

6 cents—Alabama, California, Colorado, Georgia, Idaho, Oregon, Montana, New Mexico, Nebraska, Virginia, Maryland, Maine, and the District of Columbia.

5½ cents—Nevada.

5 cents—Arizona, Utah, Wyoming, North Dakota, South Dakota, Kansas, Minnesota, Iowa, Illinois, West Virginia, Pennsylvania, Delaware, Vermont, New Hampshire and Massachusetts.

4½ cents—Michigan.

4 cents—Texas, Wisconsin, Indiana, New York, New Jersey and Connecticut.

3 cents—Missouri.

Fight for Markets Waged

Long wondered about, often guessed at, the actions of various oil-producing states engaged in the sharpening struggle for domestic crude markets have begun to shape themselves. But they may only add to the fire of discontent which began sputtering when domestic producers first felt imports were supplanting, instead of supplementing, domestic crude.

The controversy, now full-fledged, centers about imports and crude

offered to U. S. markets by states which practice no proration programs.

Texas, apparently moving to hold its markets in a tight grasp, approved a producing schedule of 18 days for March, making a statewide total daily yield of 3,279,263 barrels. This will result in the state's second highest oil quotas in history, exceeded only by a permissive flow of 3,387,245 barrels daily in November, 1952.

Oklahoma, however, points to a steady decline in its traditional oil market and feels it is not being treated fairly by certain major oil purchasers. This view is reflected in statements by independents as well as in official circles.

Oklahoma Governor Raymond Gary blames certain oil-producing states which do not prorate production and said he "feels all states should practice conservation" and that "it is not fair for Oklahoma to hold down production and let some states run their production uncontrolled."

Meanwhile, the Oklahoma legislature, which is now in session, is studying the oil situation. Among bills under consideration is one that would set by law a minimum daily allowable of 25 barrels on a lease basis for Oklahoma wells.

Texas' allowable boost and Oklahoma's consideration of a 25-barrel daily minimum came in the face of a warning by the Independent Petroleum Association of America that substantial cutbacks in domestic crude production may be necessary in March and April as result of increased imports and slackening market for domestic crude.

Imports, the continuing center point in this controversy, are on the upswing. IPAA says imports for February through April will total 1,250,000 barrels a day. Last year, daily average total imports amounted to 1,063,000 barrels, based on Bureau of Mines figures for the first 11 months and American Petroleum Institute total for one month.

Steel Supply Outlook Good

General outlook for steel supplies for the petroleum industry this year is good despite the growing demand by automotive, other durable goods industries and the export market. Steel production operations in recent weeks have been at about 85 percent of rated capacity, its highest pace in more than a year.

While there have been indications of a tight squeeze in supply of some steel products, primarily cold rolled sheets, industry officials say that, barring an all-out war in 1955, there is ample steel capacity to supply oil country tubular goods and line pipe to meet the needs of an estimate by WORLD OIL of 52,612 new well completions and a prediction by *Pipe Line Industry* for the laying of 19,900 miles of new crude, natural gas and products pipe lines.

There is a growing demand for high tensile casing which is more desirable for use in deep wells. While the steel industry's capacity to produce this material is limited, it is growing. Over-all, industry sources say the market for oil country tubular goods and line pipe is still quite competitive regardless of the tightness of supplies of some other steel items. Total supplies of drill pipe, casing and tubing in warehouses and operators' inventories are considered ample, though over-all inventories have not reached the level of prewar years.

Expanded production capacity and improved shipping schedules have reduced the needs for the prewar type of heavy warehouse inventories, though some observers predict that the Far Eastern situation could result in a flurry of advanced orders of oil country tubular goods for stock-building purposes. It is not expected, though, that advanced orders for inventory building would result in any curtailed supplies for current needs.

Shipments of oil country tubular goods and line pipe (excluding imports), the largest volume steel items used by the petroleum industry, last year declined by nearly 12 percent from 1953 to total 5,526,663 tons. Shipments of oil country tubular goods increased from 2,019,345 tons to 2,291,176 tons, reflecting a substantial increase in total wells completed and footage drilled. Line pipe shipments, however, declined to 2,594,873 tons in 1954 from 3,507,318 tons the preceding year. There was a slight decline in total pipe line mileage completed in 1954 from the previous year and a decline in the total mileage of large diameter pipe lines completed.

TIPRO Pushes Waste Bill

The scrappy Texas Independent Producers and Royalty Owners Association was lending its muscles last month to a legislative haymaker aimed at raising lumps on the interstate pipeliners and goose pimples on the Federal Power Commission.

The proposed law is an "Economic Waste Bill," which would empower the Texas Railroad Commission "to determine the value or values required to be received or attributed to gas produced from any well, field or area of a field in this state to prevent waste . . . ."

For the enlightenment of those who construed the word "value" as meaning price-fixing, TIPRO immediately tabbed the measure as "an anti-price-fixing measure." It will, said TIPRO, "eliminate the present price fixing of natural gas by the powerful pipe line monopolies in Texas."

TIPRO declared that "a huge volume of natural gas is committed for delivery to Northern and Eastern factories for boiler use. After being piped 1500 miles, this Texas gas sells more cheaply than it does at home. This is indeed an economic waste of a great natural resource. The bill will make it impossible for big pipe line companies to buy enough 3 and 4 cents gas to capture and subsidize Northern industrial markets."

TIPRO is just as positive that the measure would "go far toward erecting an effective barrier against federal regulation and control of the entire gas industry." However, at Houston, where TIPRO President Jack Woodward of Dallas made a stand in his fast-hopping tour over the state in defense of the measure (and for a Natural Gas Act amendment and a tariff on imports), he refused to concede that the measure, by setting a floor on "values," would necessarily bring on a collision with FPC price ceilings.

He drew the analogy of a rifle-toting farmer standing in the path of a pipe line spread. Without pointing the gun or offering a threat, the farmer might prevent his property line from being crossed.

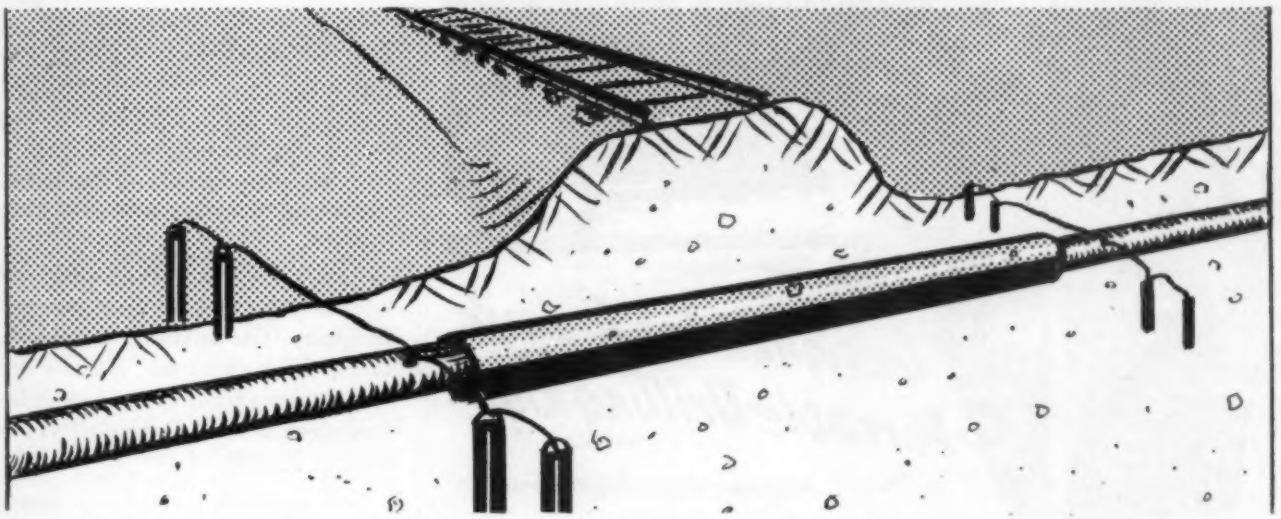
For the time being, at least, FPC officials decline to deny the point. Said Commissioner Seaborn L. Digby: "There has . . . never been a test case of this type even though Kansas and Oklahoma have minimum price laws."

Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

$15 Per Rule of Thumb

These formulae from the pages of engineers' own notebooks yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Send your Rule of Thumb to Donald M. Taylor, Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1.



Corrosion Protection

—10—How many magnesium anodes are needed for supplementary protection to a short-circuited bare casing?

For 17-pound anodes, use A ρ/50,000 to give the number needed for the casing alone; A is the area of the casing, in square feet, and ρ is the soil resistivity in ohm-centimeters. The life of the anodes may be estimated from ρ/180. If the life in years, as given by this expression, is too short, refigure for 32-pound anodes, using A ρ/55,000 for the number and ρ/100 for the life. If this is still too short, figure for 50-pound anodes; number is A ρ/60,000 and life is ρ/65.

Such an installation, grouped on both sides of the line at each end of the casing, will enable the main line protection unit to carry beyond the casing; the values obtained above are approximate only, and should be checked by potential measurements after installation.

Example: Suppose the pipe line has shorted out to 45 feet of 24-inch bare casing. Soil resistivity is 1100 ohm-centimeters. How many 17-pound anodes would be required for supplementary protection?

$$\text{Number of Anodes} = \frac{A\rho}{50{,}000}$$

$$A = 2 \times 3.14 \times 45 = 283$$

$$\text{Number of Anodes} = \frac{(284)\ (1100)}{50{,}000}$$

$$= 6.21$$

Place three anodes at each end of casing. Their life expectancy will be

$$\frac{1100}{180} = 6 \text{ years}$$

Pipe Line Men

IN THE NEWS

R. D. Turner has been appointed special assistant to the president of **Skelly Oil Company** and will be responsible for the sale of gas from all of the company's producing leases.

L. L. Byars will be in charge of procurement of gas for all of the Skelly gasoline plants, the sale of residue gas, the development of new gasoline plants and community plant situations.

O. M. Wickizer, formerly assistant supervisor of gas accounting in the Manufacturing department, has been named supervisor of all gas accounting for Skelly.

John F. Burton

William M. Rice

John F. Burton, former vice president and treasurer of **Transcontinental Gas Pipe Line Corporation,** was recently named financial vice president by the board of directors.

Since 1925, when Burton first joined the staff of Virginia Electric and Power Company, he has held various positions dealing with the financing and accounting of public utilities.

At the same time, **William M. Rice** was named treasurer of the company. Formerly vice treasurer in charge of taxes, Rice came to Transco from Washington, D.C., where he had been a member of the law firm of Walker, Rice & English.

S. L. Lamkin, former supervisor of general accounting, was named assistant controller. He has been with Transco since 1950.

•

I. W. (Spider) Dods has been named pipe line construction superintendent by **Transcontinental Gas Pipe Line Corporation,** Houston. Before joining Transco in 1951, Dods was with Fish Constructors, Inc. With Transco, as pipe line construction engineer, he has had a series of major assignments on such projects as the submarine crossing of The Narrows between Staten Island and Brooklyn and the new 36-inch lines in Mississippi and Alabama.

I. W. Dods

It takes rugged, dependable truck winches to move today's portable draw works, power units and masts. You are always sure and safe when your trucks are equipped with BRADEN WINCHES. They are made in capacities from 3,000 to 100,000 pounds.

The easy-to-operate BRADEN PATENTED OIL-COOLED, FULLY ADJUSTABLE, AUTOMATIC SAFETY BRAKE assures operator of keeping the load always under perfect control.

BRADEN WINCHES are Standard of the Oil Industry.

See Your Dealer or write to factory for information.

BRADEN WINCH COMPANY
P.O. Box 547, Broken Arrow, Oklahoma

BRADEN Winches

B. D. Leuty of Bartlesville, Okla., has been named to manage all pipe line transportation facilities of **Cities Service Oil Company** and subsidiaries, and has been elected vice president of **Cities Service Pipe Line Company. R. E. Roehl** and **William H. Sloan** have been made assistants to the new manager.

B. D. Leuty

Leuty, who was formerly special assistant to vice president **C. S. Mitchell,** is also project manager for the new jointly-owned Badger products pipe line and is vice president and general manager of the Crude Oil Pipe Line division of **Cherokee Pipe Line Company.** He joined Cities Service in 1924 as a member of the engineer-training program.

Harry Nelson of Bartlesville has been named manager of oil pipe line operations and **James W. Fagan** will manage the newly-organized products pipe line division of Cities Service.

•

David E. Luddeke, former division foreman of the Tomball, Texas, district of **Pan American Pipe Line Company,** has been transferred to Northern division headquarters at Longview, Texas. **Gilbert Rice,** formerly in charge of the Quitman district, replaces Luddeke at Tomball.

•

Charles W. Brown, chief clerk of the Measurement and Research department of **Texas Gas Transmission Corporation** since 1952, has been promoted to assistant superintendent. Succeeding Brown as chief clerk is **Raymond S. Kramer,** former engineer in the department.

Both Brown and Kramer joined the Texas Gas engineering staff in 1949.

•

Edgar S. Coffman has been appointed regional engineer of the Fort Worth, Texas, regional office of the **Federal Power Commission.** He succeeds **Wilbur F. Fairlamb,** who has resigned.

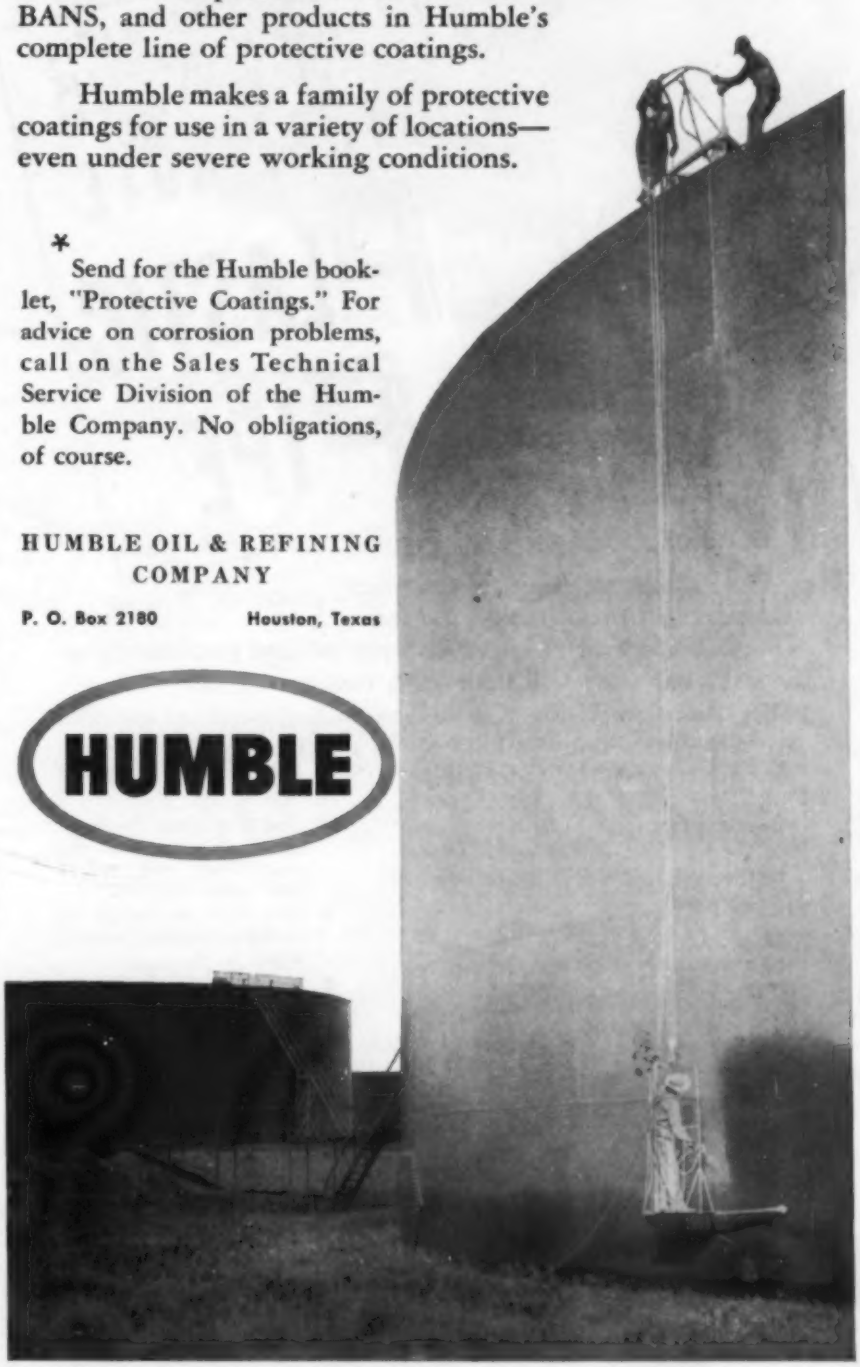
Coffman first joined the FPC staff in 1933 and has been chief of the rates division since 1945.

RUST-BANS STOP CORROSION

Inside or out—in any climate—on storage tanks or finely-machined parts—you can depend on Humble RUST-BANS to stop corrosion.

Industries of all kinds in 28 different countries around the world are solving their corrosion problems with the RUST-BANS, and other products in Humble's complete line of protective coatings.

Humble makes a family of protective coatings for use in a variety of locations—even under severe working conditions.



*

Send for the Humble booklet, "Protective Coatings." For advice on corrosion problems, call on the Sales Technical Service Division of the Humble Company. No obligations, of course.

HUMBLE OIL & REFINING COMPANY

P. O. Box 2180 **Houston, Texas**

HUMBLE

R. G. Pennington has been named assistant to the president of **Tuscarora Pipe Line Company, Ltd.** He replaces **Henry Hofmann** who has retired. Pennington joined Tuscarora after 18 years in supply and distribution assignments with Esso Standard Oil Company in New York. During the last six years he was in charge of the Products Pipe Line section of the Supply department.

H. W. Branum, Wichita Falls, Texas, has been promoted to superintendent of **Pioneer Pipe Line Company,** with headquarters at Salt Lake City. Pioneer is owned by Continental Oil Company and Sinclair Pipe Line Company.

Branum has been an engineer for Continental Pipe Line Company's North Texas district operations since 1950. Previously he served two years with Conoco at Ponca City, Okla.

Ernest A. Slade

Charles W. Miller

Ernest A. Slade, of Tulsa, has joined **Warren Petroleum Corporation** as manager of the Pipe Line department, following his resignation as superintendent of maintenance and construction for Service Pipeline Company. **Charles W. Miller,** formerly general superintendent of Midland Gasoline Company at Conroe, Texas, has joined Warren as Slade's assistant.

Slade has had several years of experience in pipe line construction and operation as well as other phases of the petroleum industry having been with Petroleum Engineering, Inc., at Tulsa, Parade Gasoline Company, Hanlon-Waters, Inc., Climax Industries, Inc., and Service Pipe Line Company.

Miller joined the Hanlon companies in 1934 and two years later was transferred to the Hanlon Pipeline Company. He became chief operator at the Gregg-Tex Gasoline Company plant in 1937 and in 1939 joined the Midland Gasoline Company as general superintendent.

•

E. J. Stephenson is the new president of **Petroleum Construction Company** of Corpus Christi, Texas. The company has laid one of the longest offshore pipe lines in the world, 120,000 feet of gathering system off the Texas Gulf Coast.

E. J. Stephenson

Stephenson was formerly construction engineer with Sinclair Oil Company and engineer for Tennessee Gas Transmission Company and Fish Constructors. In 1950 he joined Petroleum Construction Company which he now heads.

Other officers include **J. D. Mayfield, Jr.,** vice president and treasurer, and **T. R. Wimbish,** secretary.

STOP CORROSION AND PARAFFIN PROBLEMS WITH TUBE-KOTE PLASTIC PIPE

Here's how to eliminate corrosion and paraffin problems on gathering lines — install Tube-Kote Plastic Pipe! No need to wrap or tape because Tube-Kote Plastic Pipe will never rot, rust or corrode!

Use Tube-Kote Plastic Pipe and you will eliminate all corrosion problems at one time. You will also eliminate paraffin deposition and save shut-down time and maintenance costs. You will have a better pipe that will last years longer.

You can transport Tube-Kote Plastic Pipe for less cost, and install it in less time, because it is only 1/6 the weight of steel pipe!

Made by Tube-Kote, Inc. — world's largest processors of plastic coatings and linings for steel pipe—pioneers in plastics since 1939!

- Used throughout the industry for gathering lines, disposal lines, gas service lines, water lines, etc.
- Only 1/6 the weight of steel pipe—easier, faster to install.
- Smooth interior surface reduces friction loss—slashes pumping costs!
- No wrapping or taping needed—Tube-Kote Plastic Pipe is self-protective.

Write today for information and prices.

TUBE-KOTE, INC.
P. O. Box 20037 • Houston 25, Texas

TUBE-KOTE
First Name In Corrosion Resistance

TUBE-KOTE T.M. Reg.

W. L. Kygar

At the regular meeting of the board of directors of **Platte Pipe Line Company** in January, **W. L. Kygar,** president of the Continental Pipe Line Company, Ponca City, Okla., was elected a member of the board.

He succeeds **Charles A. Perlitz, Jr.,** senior vice president of Continental Oil Company.

Other members of the Platte board include **K. A. Covell,** The Pure Oil Company; **A. A. Davidson,** Sinclair Pipe Line Company; **D. R. Williams,** The Ohio Oil Company; **R. E. Kepke,** The British American Oil Company; **R. F. Sturgis, Jr.,** The Pure Oil Company; **H. L. Phillips,** Sinclair Oil Corporation; **Jack H. Rice,** The Ohio Oil Company; **W. G. Sexton,** The Toronto Pipe Line Company; **T. A. van Griethuysen,** Continental Oil Company; and **R. F. Moore,** Platte Pipe Line Company.

•

James C. Phelps, Salt Lake City, Utah, has been promoted to manager of development and technical advisor for **Continental Pipe Line Company,** with headquarters in Ponca City. He was formerly superintendent of Pioneer Pipe Line Company, an affiliate of Continental Oil Company.

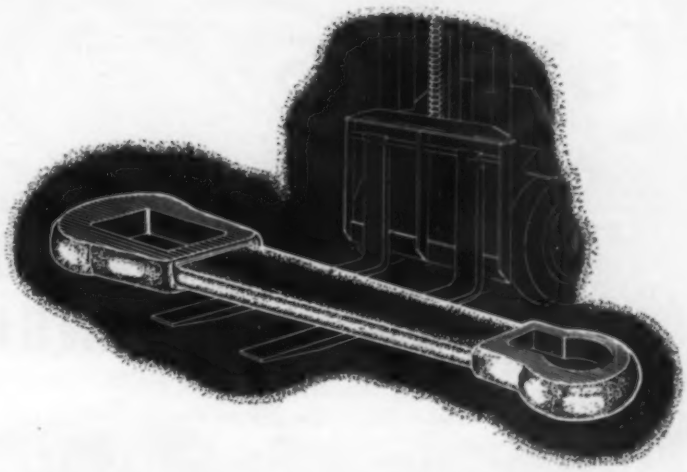
Phelps succeeds **F. C. Whiteside,** who recently transferred to Calgary, Alberta, Canada, to become associated with Hudson's Bay Oil & Gas Company, Ltd., Continental's Canadian affiliate.

The promotion of **L. P. Waddell,** Billings, Mont., to superintendent of Continental Pipe Line Company's communications division has also been announced. He succeeds **Frank E. McFarlin** who recently was appointed senior office engineer for the company at Ponca City.

•

F. A. Hough, formerly vice president of Southern Counties Gas Company, has joined **Bechtel Corporation** as consulting engineer. His headquarters will be in the San Francisco office of Bechtel.

Worn?
Mismachined?



**VANDERLOY*
is the answer.**

Connecting rods, power cylinders, shafts, rods—i.d. or o.d. surfaces—all can be restored to design dimensions by the application of VANDERLOY.

VANDERLOY* an electrolytic iron that bonds atomically with most ferrous metals, aluminum, copper, nickel and their alloys.

Write for additional information on this NEW reclamation service.
Dept. PL-2, VAN DER HORST CORPORATION, Olean, N. Y.

VAN DER HORST

TERRELL, TEXAS
OLEAN, NEW YORK
LOS ANGELES, CALIFORNIA**
HILVERSUM, HOLLAND

***Patents applied for**

****SparTan Engineering West Coast Licensee**

For more data on advertised products, use Readers' Service Cards, last page.

What's Happening

AMONG SERVICE AND SUPPLY MEN

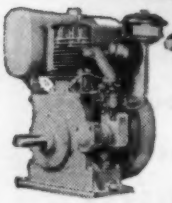
Bendix Names General Manager For Zenith Carburetor Division

E. M. Bimberg has been appointed general manager of the Zenith Carburetor division of Bendix Aviation Corporation.

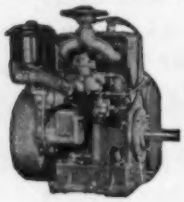
His appointment will enable G. C. Fricke, formerly general manager of both the Zenith and Skinner divisions, to devote his entire attention to Bendix Skinner, which has built a new plant at Royal Oak, Mich.

Bimberg joined Zenith in 1916. In 1927 he was promoted to design engineer and in 1938 to chief engineer. During World War II he was named factory manager. After the war he returned to his post as chief of the Engineering department for Zenith's line of truck, tractor, marine and industrial carburetors and filters.

Vital Oil Circulating Pump powered by WISCONSIN HEAVY-DUTY *Air-Cooled* ENGINE



3 to 9 hp. single-cylinder models.



7 to 15 hp. 2-cylinder models.

15 to 36 hp. V-type 4-cylinder models.

Down at a field in Stephens County, Oklahoma, this oil circulating pump works, hour after hour, day after day. It's powered by a Wisconsin Heavy-Duty Air-Cooled Engine, best choice when you need an engine that's built to deliver continuous heavy-duty service.

And in the oil fields the story is the same wherever equipment reputation is built by reliability. Oil men know that Wisconsin Engines go on delivering dependability day after day, month after month. The reasons for this kind of service are many. Such features as tapered roller bearings at both ends of the crankshaft, and fool-proof air-cooling in all temperatures are very important performance factors. Also contributing to no-complaint operation is a trouble-free ignition system with an easily-serviced OUTSIDE magneto, along with heavy-duty construction even in those parts not vital to dependable service. No wonder, when you need power that *ranks first*, your *first choice* should automatically be Wisconsin Engines.

Power TO FIT THE JOB

Power TO FIT THE MACHINE

4-cycle single-cylinder, 2-cylinder and V-type 4-cylinder models, 3 to 36 hp.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
619 SOUTH MAIN STREET • TULSA, OKLAHOMA
3420 McKINNEY AVENUE • HOUSTON, TEXAS
505 SOUTH MAIN STREET • WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS

A 8151-½-I

Actor John Boles Heads Pipecote Service Company

John Boles, internationally known singing star, today plays an entirely different role in the business world as president of the $700,000 corporation, Pipecote Service Company of San Angelo, Texas.

John Boles

Specializing in internally cleaning and plastic coating pipe lines in place, Pipecote is licensed to operate in 45 states under the patents of Pipelife, Inc.

Boles became interested in Pipecote during a business trip to Texas. While still living in Beverly Hills, he planned a four-day trip to observe drilling operations of an oil company in which he had invested. He became so interested in the activities, however, he remained four months. It was during this time that he learned of the Pipecote Company which was then being organized, and with an interest in new enterprises with apparent potentialities, he became a stockholder in the company. He was later elected president.

Boles has made more than 70 pictures during his 25 years on the screen, starring with such actresses as Gloria Swanson, Bebe Daniels, Irene Dunne, Barbara Stanwyck, Loretta Young, Joan Bennett and Paulette Goddard. He played opposite Mary Martin in the Broadway show, "One Touch of Venus."

Born in Greenville, Texas, Boles is a graduate of the University of Texas. He is now living in San Angelo.

Jensen Engineering Company To Produce Shortstir Mixers

The manufacture of Shortstir mixers has been taken over by the new Jensen Engineering Company of Tulsa, Okla. The company was formed because of the growth of the Shortstir mixer line of Sawyer-Jensen-Ross Company.

The latter company has been dissolved, but Sawyer will continue manufacture of its construction equipment line as Sawyer Manufacturing Company.

Jensen Engineering will retain the Shortstir engineering, sales and manufacturing personnel. A. C. Jensen is president of the new firm.

Allied Chemical & Dye Names Barrett Division Vice President

Appointment of C. G. Stupp as vice president, has been announced by the Barrett Division, Allied Chemical & Dye Corporation.

Stupp has been technical director of Barrett since 1951. He was first employed 38 years ago as a research chemist in the Edgewater plant.

He will continue to head technical activities of the division including the extensive Research and Development department with laboratories in Edgewater, N. J., Glenolden, Penn., and Toledo, Ohio.

Pearce Named Works Manager Of B-I-F Industries, Inc.

R. W. Pearce has been promoted to the post of works manager of B-I-F Industries, Inc. The position has been vacant since February, 1953, when Earl H. Bradley, works manager at that time, was elected president of the firm.

R. W. Pearce

Pearce started with Builders Iron Foundry as a machinist in 1936. From that time he has served the company as toolmaker, estimator, production controller, router, manager of machine tool sales, manager of the war contracts division, project sales engineer and, most recently, manager of chlorinizer sales.

Four Promotions Announced At Tube Turns Western Division

Tube Turns has announced four changes in the company's Western division.

L. O. Morris, formerly sales representative in Denver, has been made district manager of the Mid-Continent territory, with headquarters in Tulsa.

Daniel V. Pisano, formerly a member of the sales staff of the New York office, has been appointed manager of the San Francisco district.

Norton P. Bosemer, formerly manager of the Los Angeles office and plant, has been moved up to district manager of the Los Angeles territory.

E. R. Muir, Jr., formerly sales representative at Seattle, has been appointed district manager of the Northwestern territory, with headquarters in Seattle.

Before the staff changes were made, the Los Angeles and Seattle offices operated under the San Francisco office.

Reilly Tar & Chemical Appoints Fisher New Plant Manager

Charles A. Fisher has been appointed plant manager of the Maywood, Indianapolis multiple plant operation of the Reilly Tar & Chemical Corporation.

C. A. Fisher

In the banking business before joining Reilly 20 years ago, Fisher was formerly in the Accounting and Sales departments and recently served as coordinator of production with headquarters at the Indianapolis office of the company.

J. F. Pritchard Names Two Southern Sales Representatives

J. F. Pritchard and Company of California has announced the appointment of two Southern sales representatives.

J. L. Brownlee and Gordon Morrow of the Brownlee-Morrow Engineering Company in Birmingham, Ala., will represent J. F. Pritchard & Company in Alabama and the western tip of Florida.

Rittelmeyer and Company, Inc., of Atlanta, Ga., will represent the company in Georgia, Eastern Tennessee and Eastern and Southern Florida.

MORRISON CONSTRUCTORS used Cleveland "320's" to keep trenching operations well ahead of the pipe gangs on this 30-inch TGT line, in spite of tough digging in Louisiana.

On this 99-mile spread the trenchers worked in a wide variety of terrains and soil conditions—from heavy timberland to rice fields and numerous swamps and marshes. In some flooded rice fields, water was flumed from the right-of-way, the trench was cut by the Clevelands and then pumped dry.

For *every* pipeline job, tough digging or easy going, there's a Cleveland Trencher that will help you do the job profitably. Get the full story from your Cleveland Distributor or write: THE CLEVELAND TRENCHER COMPANY, 20100 St. Clair Ave., Cleveland 17, Ohio.

(Adv.)

A Book You Should Have on Mechanical Sealing...

A complete reference catalog on Dura Seal—the engineered mechanical seal that rotates with the shaft. Amply illustrated . . . specific applications . . . installation data. A fact book of real value to designers, operators and maintenance departments.

WRITE FOR DURA SEAL CATALOG NO. 455 PI

DURAMETALLIC CORPORATION

KALAMAZOO, MICHIGAN

INSTALL
peak performance
INTO YOUR
compressors
(AIR • GAS • AMMONIA)

Peak performance, maximum efficiency, greater output, and lower power costs can be built into your oldest, and of course your newest, compressors by the installation of VOSS VALVES.

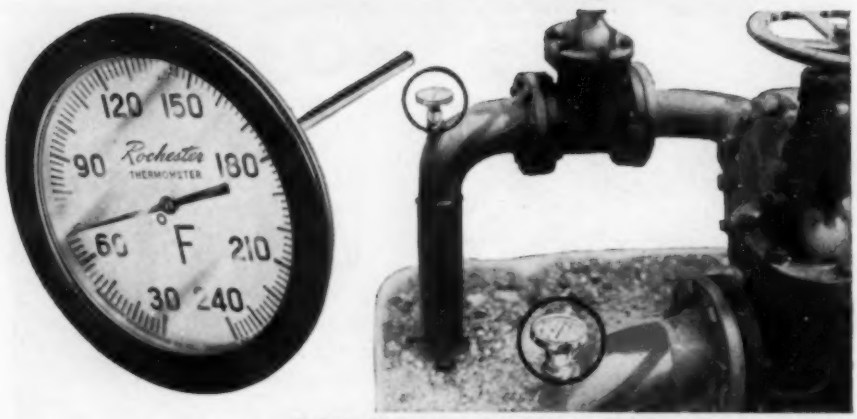
Check THESE VOSS VALVE ADVANTAGES:

- Quiet, vibration-free operation
- 20 to 60% more valve area
- less power consumption
- minimum pressure loss
- normal discharge temperature
- lower operating costs
- utmost safety

Our detailed proposal for increasing the efficiency of your compressor will be sent you without obligation. Send us the name, bore, stroke, and speed of your machine.

J. H. H. VOSS VALVES
REG. U.S. PAT. OFF.

VOSS VALVES / J. H. H. VOSS Co., Inc. 785 East 144th Street, New York 54, N. Y.



Rochester Thermometers give dependable service in this gas booster station.

Where are most of your thermometers?

Most refinery thermometers must be located outdoors, where they're subjected to weather, corrosive fumes, and salt air.

But these conditions are no longer problems with Rochester Thermometers. The all stainless steel welded case is practically immune to all these corrosive agents. Hermetically sealed, pressure-tight dial Rochester Thermometers will give you years of dependable service and *you* can recalibrate them from the outside.

For many installations, you'll be interested in the new Rochester Straight Form Thermometer. It has the same durability and dependability found in all Rochester Thermometers—PLUS a stem that can be mounted anywhere around the dial.

FOR FURTHER INFORMATION, call your Rochester representative, or write:

Rochester Manufacturing Company, Inc.
202 Rockwood St., Rochester 10, N. Y.

DIAL THERMOMETERS GAUGES AMMETERS

Marion Power Shovel Sets Up Sales and Service Department

Establishment of a consolidated Sales and Service department for the entire line of Marion-Osgood-General equipment in both domestic and export markets has been announced by Marion Power Shovel Company.

D. E. Rizor

D. E. Rizor has been named to head the coordinated program as vice president for sales and service. Kenneth E. Williamson, Marion-Osgood-General sales manager, small machines, will have charge of the sale of equipment in sizes of four cubic yards and under throughout the U. S. and Canada. Richard M. Bessom, as export sales manager, is in charge of sales of the complete line of machines through an organization of distributors abroad.

Rizor joined Marion in 1925 as a shop clerk. He advanced successively to Production department, Parts department and Sales department. In charge of the Chicago office for 13 years and the New York office for two years, he returned to Marion in 1948 as assistant to the vice president—sales. In April, 1954, he was named vice president—service, parts and pricing.

Merger of Manufacturing Firms Approved by Shareholders

The merger of Burgess-Manning Company and Penn Industrial Instrument Corporation has been approved by shareholders of each company.

Burgess-Manning Company will continue its present activities, which include the manufacture of industrial silencing equipment and architectural acoustical products. The Penn business, consisting of the manufacture of industrial instruments, will be continued as a division of Burgess-Manning Company.

The Burgess shareholders elected William C. Bennett and William Melas, principal executive officers of Penn, directors of the merged company. The former officers of Penn will continue in direct charge of the Industrial Instrument division.

Gustav Schwab to Head Dravo Ohio Pipe Fabrication Plant

Appointment of Gustav Schwab, Jr., as manager of its Marietta, Ohio, pipe fabrication plant has just been announced by the Machinery Division of Dravo Corporation, Pittsburgh.

With Dravo since 1939, Schwab has been superintendent of production control at Dravo's Wilmington, Del. shipyard, and for six years was sales engineer in Pittsburgh and New York City. Since 1951 he has been assistant purchasing agent for the corporation.

Pipe Line Anode Corporation Appoints New Chief Engineer

Thomas M. Ragland has been named chief engineer of Pipe Line Anode Corporation. His appointment furthers the surveying, engineering and installation services offered by the company.

Ragland has been associated with Phillips Petroleum Company during the past four years as a corrosion engineer.

Dunn Joins Wheatley Supply As Assistant to the Manager

Frank H. Dunn, Jr. has joined Frank Wheatley Supply Company as assistant to the manager. He replaces John R. Fitzpatrick who will devote full time to sales engineering in the field.

Frank H. Dunn

Dunn was formerly with Deep Rock Oil Corporation as assistant to the Pipe Line department superintendent. He is a business graduate of Tulsa University, having previously completed two years of engineering at Purdue.

Four Appointed to New Posts In Koppers Tar Products Division

C. H. Teller has been appointed production manager for the Tar Products division of Koppers Company, Inc. With Koppers since 1943, he was formerly manager of the division's Engineering department.

Succeeding Teller is C. T. Barker, former assistant manager, Technical department. He has been with Koppers since 1927.

C. E. Brown, who has been with Koppers since 1949, has been appointed production manager of the Follansbee, W. Va., plant, the largest plant of the Tar Products division. He was formerly manager of the division's Production department in Pittsburgh.

M. D. Chamberlain was appointed assistant manager, Technical department of the division, replacing Barker.

Two Receive Top Appointments At H. K. Ferguson Company

The H. K. Ferguson Company has announced the appointment of Robert R. Cutler as vice president and central district manager. At the same time, C. J. Haglund of Seattle was named vice president and manager of the company's Western district office in San Francisco.

Cutler has been acting manager of the Central district since October. He joined the Ferguson Company as contract manager of the Central district in June, 1949.

Haglund is a former vice president of the Morrison-Knudsen Company, Inc. He joined them in 1944 and for the last two years has managed their Alaska district. Morrison-Knudsen is the parent company of Ferguson.

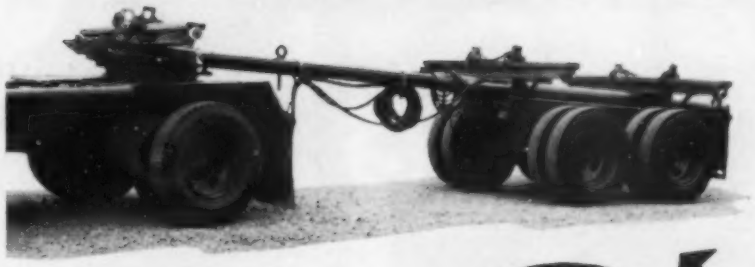
Denver Manufacturing Firm Establishes Canadian Subsidiary

Stearns-Roger Manufacturing Company of Denver announces the establishment of a subsidiary company in Calgary, Alberta, the Stearns-Roger Engineering Company Ltd. Robert T. Helmer is managing director of the new firm.

The organization is wholly-owned by the parent company and will carry on the usual activities of process engineering, general engineering, fabrication and field erection for the oil and gas, power, chemical, metallurgical and sugar industries.

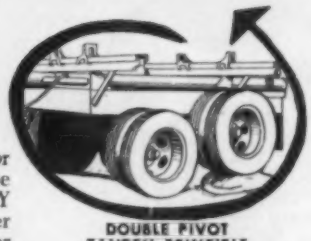
Helmer, a native of Calgary, was vice president and managing director of Franco Oil Ltd. and district manager for the Hughes Tool Company before joining Stearns-Roger.

TOP QUALITY PIPELINE TRAILER



THE LOADCRAFT

PIPELINER



DOUBLE PIVOT TANDEM PRINCIPLE

At last here's a top-quality tandem trailer for the pipeline industry that is really built to take the cross-country hikes. The axles will STAY in alignment. Quality that has made Spencer Trailers popular with the oil fraternity for over 38 years goes into each of these jobs.

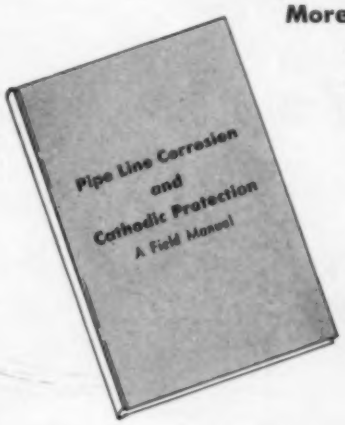
Double pivot tandem keeps load in balance in rough terrain, reduces wear and tear on axles and tires Hi-tensile pressed steel frame, wood surface block-type bolster plus other exclusive features gives you the kind of trailer you have needed .. and at a price that is less than you would expect to pay for such high quality.

Spencer-Safford LOADCRAFT
AUGUSTA, KANSAS

Please send me information on your
Pipeliner___ Pole Trailer___ Oil Field Float___
NAME_____
ADDRESS_____
TOWN_____ STATE_____

More comments on this new Handbook:

"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."



Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

An appendix has been added of technical data on Underground Corrosion, Basic Principles of Cathodic Protection, Properties of Metals and Attenuation Equations. Order copies of this practical Field Manual now for each of your field men. Price $3.

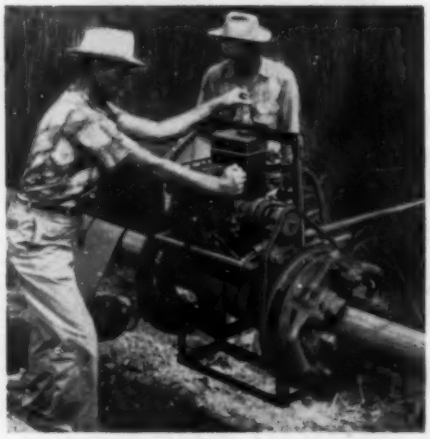
Send for your FREE copy of the New Petroleum Book Catalog which describes the nature and contents of many books pertaining to the Petroleum Industry.

ADDRESS:

Book Department
GULF PUBLISHING COMPANY
P. O. BOX 2608
HOUSTON 1, TEXAS

What's New in Equipment

for the Pipe Line Industry



Tape Wrapping Machine

Remco Manufacturing Company has introduced a new type of power driven tape wrapping machine that is light, compact, and can be used on 2-inch to 36-inch pipe.

The manufacturer states that this machine will wrap tape and 15-pound felt or kraft at the rate of 15,000 feet per day with a three-man crew. Developed by Remco and Polykene Products department of the Kendall Company, the new machine has been tested on several jobs, including the complete gas distribution system for Waynesboro, Ga.

This new machine is self-propelled, forward travel being synchronized with the wrapping head by a Linkbelt P.I.V. unit. No change of sprockets is required when changing from one width of tape to another.

For more data, circle **No. E1** or Readers' Service Card, last page this issue.

Tractor-Shovel

A new "HA" model Payloader tractor-shovel has been announced by the Frank G. Hough Company. The smallest unit in the Payloader line, this new model has twice as much lifting, digging and carrying capacity as its predecessor. The bucket has been increased 16⅔ percent, giving this new model a payload capacity of 18 cubic feet and a truck load capacity of 14 cubic feet.

Productive capacity has been increased from 50 to 100 percent and the maximum dumping height has been increased 18 percent. The new Payloader is more maneuverable with a shorter turning radius than the former model. It can be operated into and out of box cars with ease. A different bucket arm design permits breakout action of the bucket and 40 degrees of tipback. This new design makes it possible to carry heaped loads at a lower level, providing greater stability and better operator vision.

A sealed and pressurized hydraulic system has been incorporated and double-acting rams operate the boom-arms and the bucket. Other new features are the improved steering; new solenoid starting controls; new ignition lock; dust-proof distributor; improved bucket construction; hose connectors; sealed grease fittings; new pin lock design; improved ground clearance; increased drawbar pull; and new parking brake.

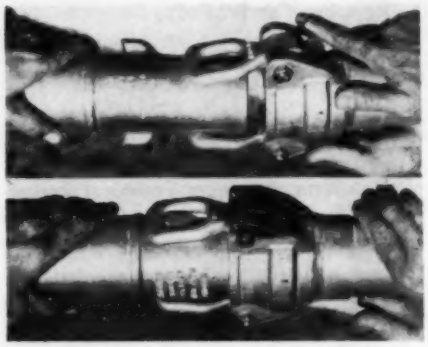
For more data, circle **No. E2** on Readers' Service Card, last page this issue.

Hydraulically-Operated Backhoe

The Earl H. Pence Company, Inc., has announced the addition of a new attachment designed for use with the Agricat, the company's crawler tractor. The new attachment, known as the Agrihoe, is an hydraulically-operated backhoe which converts the Agricat into an efficient ditch digger. When used on the Agricat with interchangeable buckets of nine-inch or 12-inch widths, the Agrihoe is suited to tight-spot trenching and digging, eliminating the slower hand labor normally associated with this type of job.

Over-all specifications show that the Agrihoe has a ten-foot reach, can dig to a six-foot depth and load to an eight-foot height. It is capable of a variety of digging operations, in addition to being used to great advantage in backfilling or rough grading.

For more data, circle **No. E3** on Readers' Service Card, last page this issue.



Aluminum Pipe

Aluminum pipe manufactured by Reynolds Metals Company is now being installed for temporary oil, gas and water lines and similar uses in the oil industry. Field tests show that the lines make possible sizeable savings in rig time, transportation and handling of pipe, laying and picking up lines and other cost factors.

The new development is based upon the use of seamless, extruded aluminum pipe, weighing less than one-eighth as much as steel pipe of comparable dimensions with a special quick coupling. The coupling contains a split "O"-ring gasket on the inside which seals when the coupling is latched in place.

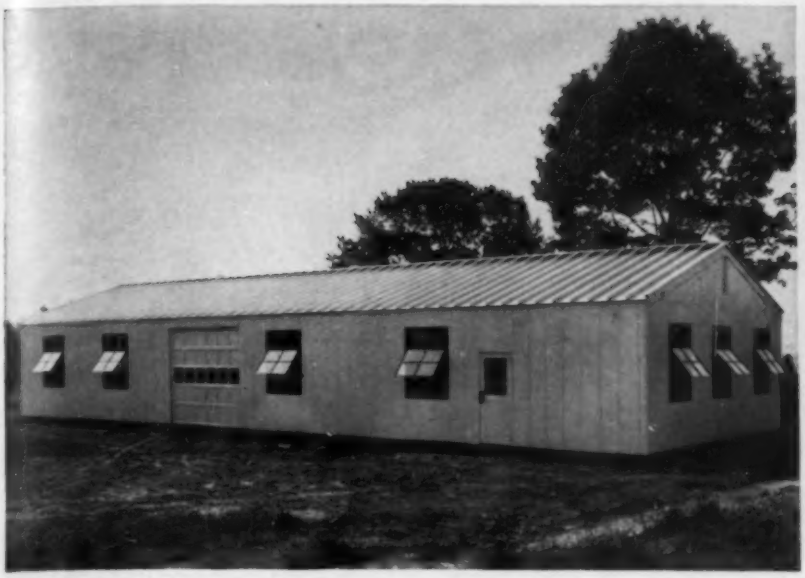
The aluminum pipe can be installed about ten times as rapidly as steel. It is available in 2⅞-inch, 3-inch, 4-inch O.D. (Schedule 5, Aluminum 63ST6) with the newly-designed oil field coupling welded on by Race & Race.

The pipe comes in standard 30-foot lengths which weigh only about 30 pounds. The coupling, shown in the photograph in both the open and the latched position, contains a split "O"-ring gasket on the inside. This seals when the coupling is latched in place, creating a non-leak coupling quickly and easily.

On an actual installation, the entire mile of 2⅞-inch aluminum pipe was handled by three men and one truck. Average stringing and coupling time was 1½ hours, and average uncoupling and loading time was also 1½ hours. Total man hours were nine hours and total truck time three hours.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

Save time! Keep informed! Circle numbers on Readers' Service Cards, last page this issue.



Armco Steel Buildings Give You...

Economies of Standardized Construction Plus Variety of Size and Layout

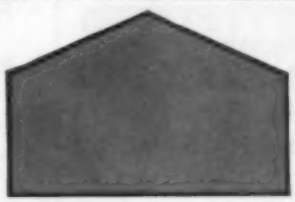
You can get the cost-saving benefits of standardized construction PLUS a wide choice of sizes and arrangements that make it easy to meet your specific needs. Whether you need a weather-tight warehouse or meter station—or an economically heated office, you'll find the practical answer in Armco Steel Buildings.

STEELOX Panel construction makes it possible! The 16-inch wide panels lock together to form sturdy walls and roof. Floor areas are practically unlimited—from 20 square feet up. A wide variety of doors, windows and other openings can be conveniently located where you want them.

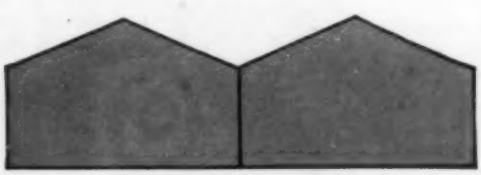
Armco STEELOX construction saves time and money too. Erection is quick, easy. You save framing, rafters, sheathing and roofing, because the panels provide both structural support and finished exterior. Workmen need no special training to do a fast, efficient job.

Write us for details about versatile Armco Steel Buildings. Armco Drainage & Metal Products, Inc., 4645 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

Clear-span widths up to 12 feet.



Clear-span widths up to 40 feet.



Any number of clear-span bays to provide almost unlimited width.

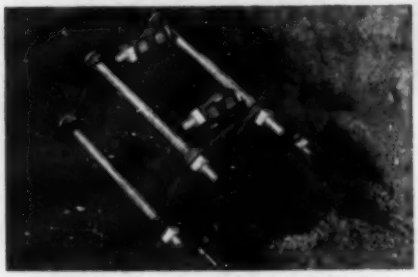
ARMCO®

ARMCO STEEL BUILDINGS

For more data on advertised products, use Readers' Service Cards, last page.

REPAIR LEAKS
QUICKLY—PERMANENTLY

SKINNER-SEAL PIPE JOINT CLAMPS stop leaks at joints. Put on under pressure—without interruption of service. Quick, simple, lasting repair. Sizes 1/2" to 24" incl. in stock.



SKINNER-SEAL COLLAR LEAK CLAMP—designed to stop every type of collar leak in oil and gas lines. Sizes: 2" to 13" inclusive.

M. B. SKINNER COMPANY
SOUTH BEND 21, INDIANA, U. S. A.

☒ Eliminate Costly PARAFFIN Removal Methods with . . .

BrakeSol

HOLDS PARAFFIN IN SUSPENSION

from
FORMATION to REFINERY

BRAKESOL is ECONOMICAL, prevents or removes Paraffin from the tubing, flow lines, tank bottoms and pipe lines. Effective on both asphalt and mixed base paraffin.

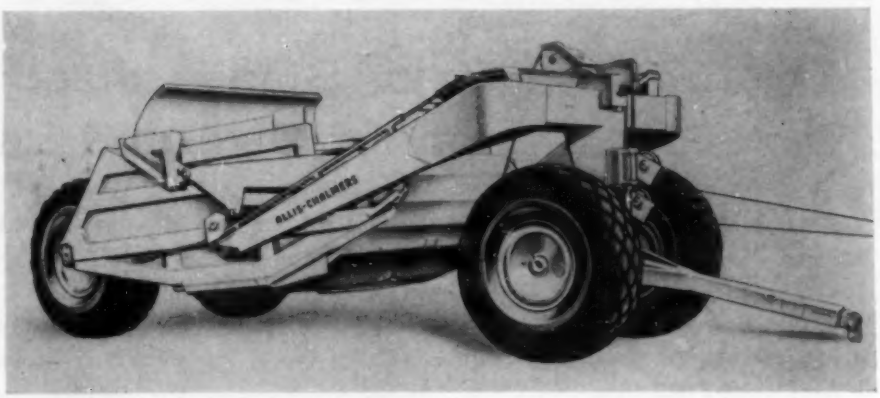
BRAKESOL is SAFE, won't harm skin; fire hazard is minimized. Sold only through supply stores. Complete service supplied by our Sales Engineers. Contact your local supply store.

WRITE FOR FREE DESCRIPTIVE FOLDER

BRAKESOL, Inc.

P. O. Box 9506 Oklahoma City, Okla.

Shovel-Crane



Pull-Type Scraper

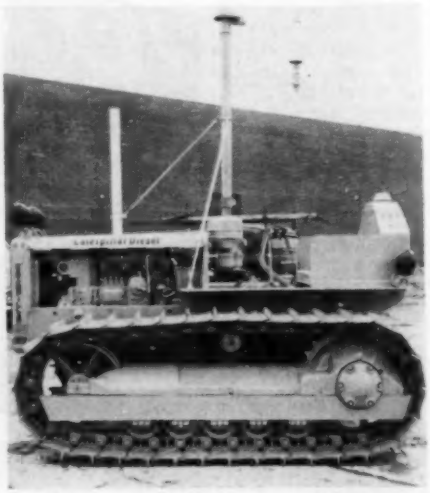
NEW EQUIPMENT photographs above with articles were reversed on Page 110 of the January PIPE LINE INDUSTRY. The picture at top is the LS-58 shovel-crane of Link-Belt Speeder Corporation, Division of Link-Belt Company. Below the shovel-crane is the Model 315 pull-type scraper manufactured by Allis-Chalmers Manufacturing Company, Tractor Division.

Roller Frame

A new five-roller, oscillating-type track roller frame is now available as an attachment for the Caterpillar D4 tractor. Installation of this track roller frame on the D4 will provide increased traction, greater flotation and better stability, particularly when the unit is operating in hilly terrain and locations where soil conditions are soft or unstable.

A tractor equipped with a five-roller track frame requires a 34 section track in place of the 31 section track included on the standard four-roller machine. If large idlers are used, a 35 section track can be installed. Light-type roller guards are available as attachments for use with the five-roller track frame.

Also available for use with the five-roller track frame are the new tool bar and tool bar bulldozer arrangements. The draft members of this tool bar are longer to permit a single position for the trunnion plates, making possible rapid changeover from front to rear operation by simply swinging the draft members to the desired position.



For more data, circle **No. E5** on Readers' Service Card, last page this issue.

New Literature

Engines Bulletin

Le Roi Division of Westinghouse Air Brake Company has published a bulletin describing and illustrating the 115 to 410 horsepower Le Roi L3000, H2000 and F1500 engines. Cutaway views and photographs show advanced features such as the modern valve-in-head design. Other features discussed are the full length guided valve stem mechanisms, light weight cam ground aluminum pistons, drop forged crankshafts with polished bearing surfaces, full flow oil filters, sectional water-cooled exhaust manifolds, large main bearings, full pressure lubrication and conveniently located controls.

To get a copy, circle **No. E6** on Readers' Service Card, last page this issue.

Engineering Data Sheet

Milton Roy Company's new data sheet describes an automatic control system used on natural gas pipe lines to inject odorants into varying natural gas flow. A controlled volume pump is used as a final control element to inject optimum amounts of odorant.

To get a copy, circle **No. E7** on Readers' Service Card, last page this issue.

Microwave Radio Systems

A description of 2000-mc microwave radio systems for a variety of applications is given in a new booklet available from Westinghouse Electric Corporation. Features of Type FR microwave radio and Type FJ multiplexing equipment and their importance to the over-all system is discussed. Points covered include frequency-division multiplexing, crystal frequency control, standby equipment, maintenance features and many others.

To get a copy, circle **No. E8** on Readers' Service Card, last page this issue.

O-Ring Catalog

A catalog describing Garlock O-rings has been published by The Garlock Packing Company. The catalog gives design information, recommended pressures and available materials for both dynamic and static applications. It contains a list of standard O-ring sizes of which popular sizes are stocked at Garlock's 29 sales offices and warehouses throughout the U. S. and Canada.

To get a copy, circle **No. E9** on Readers' Service Card, last page this issue.

NGAA Table

The Natural Gasoline Association of America has announced the publication of a revised edition of its publication 2145, "Physical Constants for the Paraffin Hydrocarbons and other Components Associated with Natural Gas." Conveniently arranged in a four page, 8½ x 11 folder, punched for standard ring binders, the table presents all the values commonly used in the analytical and engineering computations at natural gasoline plants.

All of the values for the hydrocarbons, methane through decane, were taken from ASTM Publication No. 109, "Physical Constants of Hydrocarbons Boiling Below 350° F." However, as a further convenience for natural gasoline operators, the NGAA publication presents both "Ideal" and "Corrected" values for the properties, density of vapor, ratio-gas volume to liquid volume, and gross heat of combustion of the lighter hydrocarbons methane through butane. The ASTM publication gives only the actual values corrected for gas law deviation in this range and then gives the "Ideal" values for the heavier hydrocarbons.

To get a copy, circle **No. E10** on Readers' Service Card, last page this issue.

Shaft Mounted Drives

The Falk Corporation has released a bulletin, "Shaft Mounted Drives," containing complete information, design data, selection tables, dimensions, weights and installation photographs on this modern type of standard gear drive which offers high ratios of speed reduction in limited space with considerable savings in initial cost and installation expense.

To get a copy, circle **No. E11** on Readers' Service, last page this issue.

GUNITE COATINGS for PIPE LINES

Reinforced GUNITE COATING being applied to pipe.

Your inquiry solicited.

GUNITE CONCRETE & CONST. CO.

1301 WOODSWETHER RD., KANSAS CITY 5, MO
3206 HOUSTON, HOUSTON 9, TEX.
CHICAGO — ST. LOUIS — DENVER
MILWAUKEE & TWIN CITIES — NEW ORLEANS

TEMPORARY STRAINERS

MAC-IRON SANDUSKY OHIO

Established 1901

Made by a skilled mechanic and not by "just some guy with a torch."

REVOLUTIONARY CONSTRUCTION

Smooth, efficient contours . . . no weld "blob" around edge of ring. The flange is precision rabbeted into the ring joint gasket making deformation at that point impossible.

MAC-IRON offers a complete listing of line and temporary strainers. The latter of woven wire, perforated basket and conical . . . all for use with raised face, and ring joint flanges.

A large stock on hand is maintained; special strainers made to specification. Write direct for a catalog and complete information.

The Mack Iron Works Company

Warren and Water Sts. Sandusky, O.

Non-Corrosive Products Company

of Texas

PROVIDING PROTECTION AGAINST CORROSION

To Anything Anywhere In The Oil Industry

★ Sand blasting and protective coating contractors

★ Complete protection to storage tanks both inside and outside

★ Corrosion protection for refinery and industrial equipment

★ Complete sandblasting service

Non-Corrosive Products Company

of Texas
Katy and Post Oak Roads
P. O. Box 7632
Houston, Tex.
Phone Victor 3422

See Composite and Refinery Catalogs, or Write for Specifications Folder

FLEET-LINE

PIPE SADDLES AND REDUCERS

Nozzle sizes from ¼" to 24"

ASTM A234

Also for pressure vessel heads

Nominal pipe sizes 1" to 30"

ASA B16.9
ASTM A234

Special sizes and lengths. Schedules 10 to 160

Immediate Delivery

STEEL FORGINGS, Inc.

P. O. Box 276K • Shreveport, La.

Foot of Fannin Street

NEW! Write for Bulletin.

Patented

PIPELINE VENTS AND MARKERS

FLEET-LINE CO.

P. O. BOX 276K

SHREVEPORT, LOUISIANA

Advertisers' Index

• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current 20th (1953-54) edition of The Composite Catalog of Oil Field and Pipe Line Equipment.

A

Allied Chemical & Dye Corp. 27
• Allis-Chalmers Mfg. Co. 62-63
Alston Manufacturing Co. 94b
Amercoat Corp. 21
American Machine & Metals, Inc. 12
• American Recording Chart Co. 70
• American Sand-Banum Co. 92b
• American Smelting & Refining Co. 91
American Telephone & Telegraph Co. 57
Armco Steel Corp. 111

B

Berry Division Oliver Iron & Steel Corp. ... 30
• Bethlehem Steel Co. 35
Braden Winch Co. 102
Brakesol, Inc. 112b
Ralph N. Brodie Co. 13
• Bucyrus-Erie Co. 95

C

Caterpillar Tractor Co. 6
• Clark Bros. Co. 14-15
The Cleveland Trencher Co. 107a
Columbia-Geneva Steel Division
United States Steel Corp. 19
Corrosion Rectifying Co. 88b
• Crane Co. 67

D

De Laval Steam Turbine Co. 11
• Dresser Industries, Inc. 14-15
E. I. du Pont de Nemours & Co. 81
Durametallic Corp. 107b

E

Eastman Chemical Products, Inc. 9
The Electric Controller & Mfg. Co. 79

F

• Federated Metals Division
American Smelting & Refining Co. 91
Fleet-Line Co. 114b
• Flexitallic Gasket Co. 10

G

• Gaso Pump & Burner Mfg. Co. 118
Gilbert & Barker Mfg. Co. 32
• H. P. Gott Manufacturing Co. 86b
The Griscom-Russell Co. 75
Gulf Interstate Engineering Co. 2
• The Gulf Publishing Co. 109b
Gunite Concrete & Construction Co. 113a

H

Hammond Iron Works 28
The Harco Corp. 64
Houston Contracting Co. 26
Humble Oil & Refining Co. 103

J

• Jet-Lube, Inc. 86a
• Johns-Manville Corp. 77
• Joy Manufacturing Co. 78

K

Kaiser Steel Corp. 61
Kewanee-Ross Corp. 24
• Kinzbach Tool Co. 89

L

Layne & Bowler Pump Co. 8
• Leschen Wire Rope Division
Subsidiary of H. K. Porter Co. 87
Lone Star Steel Co. 34
• Lufkin Foundry & Machine Co. 68

M

The Mack Iron Works Co. 113b
• The Mercoid Corp. 74
The Meriam Instrument Co. 88a
• Mixing Equipment Co. 29
Monsanto Chemical Co. 25

N

National Tube Division
United States Steel Corp. 19
Natural Gas and Oil Resources Committee 22-23
Newport Steel Corp. 93
Non-Corrosive Products Co. 113c

O

• Oil Well Supply Division
United States Steel Corp. 5
Oliver Iron & Steel Corp. 30

P

Tod Pazdral Pipeline Specialties 72
• Pelican Supply Co. 114d
Pipe Line Anode Corp. 92a
Pittsburgh Coke & Chemical Co. 17
• H. K. Porter Co. 87

R

The Ridge Tool Co. 69
Rio Engineering Co. 18
Rochester Manufacturing Co. 108b

S

The H. M. Sawyer & Son Co. 90
Shand & Jurs Co. 16
• M. B. Skinner Co. 112a
• A. O. Smith Corp. 73
Ray L. Smith & Son, Inc. 114c
Solvay Process Division
Allied Chemical & Dye Corp. 27
• Southern Mill & Manufacturing Co. 80
Spencer-Safford Loadcraft, Inc. 109a
• Steel Forgings, Inc. 114a

T

Texas Employers Insurance Assoc. 82
• Thornhill-Craver Co. 33
• Tretolite Co. 117
• Tube-Kote, Inc. 104

U

• Union Wire Rope Corp. 7
United States Gauge Division
American Machine & Metals, Inc. 12
United States Steel Corp. ..... 5 and 19
United States Steel Export Co. 19

V

Van Der Horst Corp. of America 105
J. H. H. Voss Co. 108a

W

• W-K-M Manufacturing Co. 31
Walworth Co. 97
Waukesha Sales & Service, Inc. 71
The Whitlock Manufacturing Co. 65
• T. D. Williamson, Inc. 76
• Wisconsin Motor Corp. 106

Y

The Youngstown Sheet & Tube Co. 20

Z

H. B. Zachry Co. 94a

Men...experience...equipment to finish your pipeline job on schedule

SINCE 1926

NOTICE: Specify PELCO Welding Saddles

No change except the corporate name. We still have the same ownership, same management, same address, same telephone, and use the same 45 years of experience to render the same service under the same trade name—"PELCO."

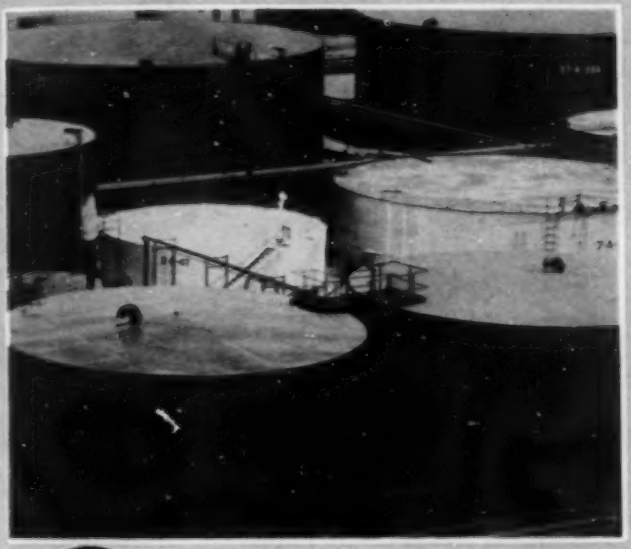
PELICAN SUPPLY CO. INC.

P. O. Drawer 1108 Shreveport (84), La.

SEE YOUR NEAREST SUPPLY HOUSE

HELPFUL SERVICES *for* PIPELINERS

Most pipeline men know that very little crude oil is shipped through lines unless it passes specifications for BS and W. Experienced pipeliners also know that the majority of producers everywhere use Tret-O-lite demulsifiers to insure that their crudes do meet pipeline specifications.

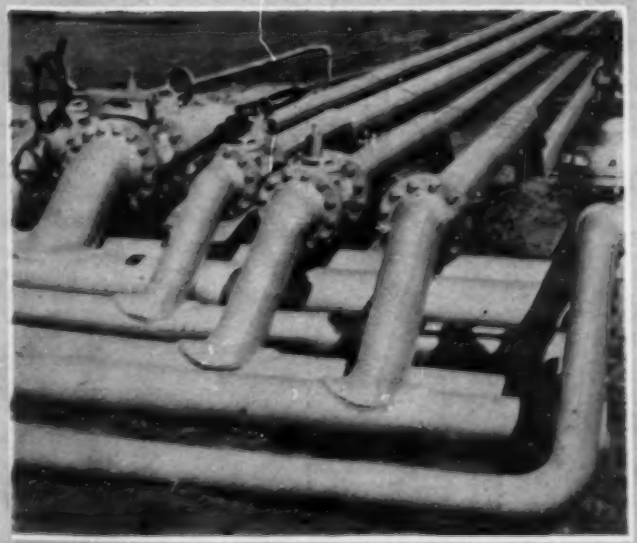


Tret-O-LitE

TRET-O-LITE DEMULSIFIERS
for eliminating tank bottoms

KONTOL

·KONTOL CORROSION INHIBITORS
for preventing corrosion and cleaning lines



The Tretolite Company also offers products and services designed to alleviate many of the problems encountered in transporting oil through pipelines. If you don't have complete information on how these products can help you, get in touch with your nearest Tretolite service engineer or write to

TRETOLITE COMPANY
A DIVISION OF PETROLITE CORPORATION
369 Marshall Avenue, St. Louis 19, Missouri
5515 Telegraph Road, Los Angeles 22, California

KPL 55-11

KONTOL

KONTOL SPECIAL CORROSION INHIBITORS ***for preventing rust and corrosion in product lines***

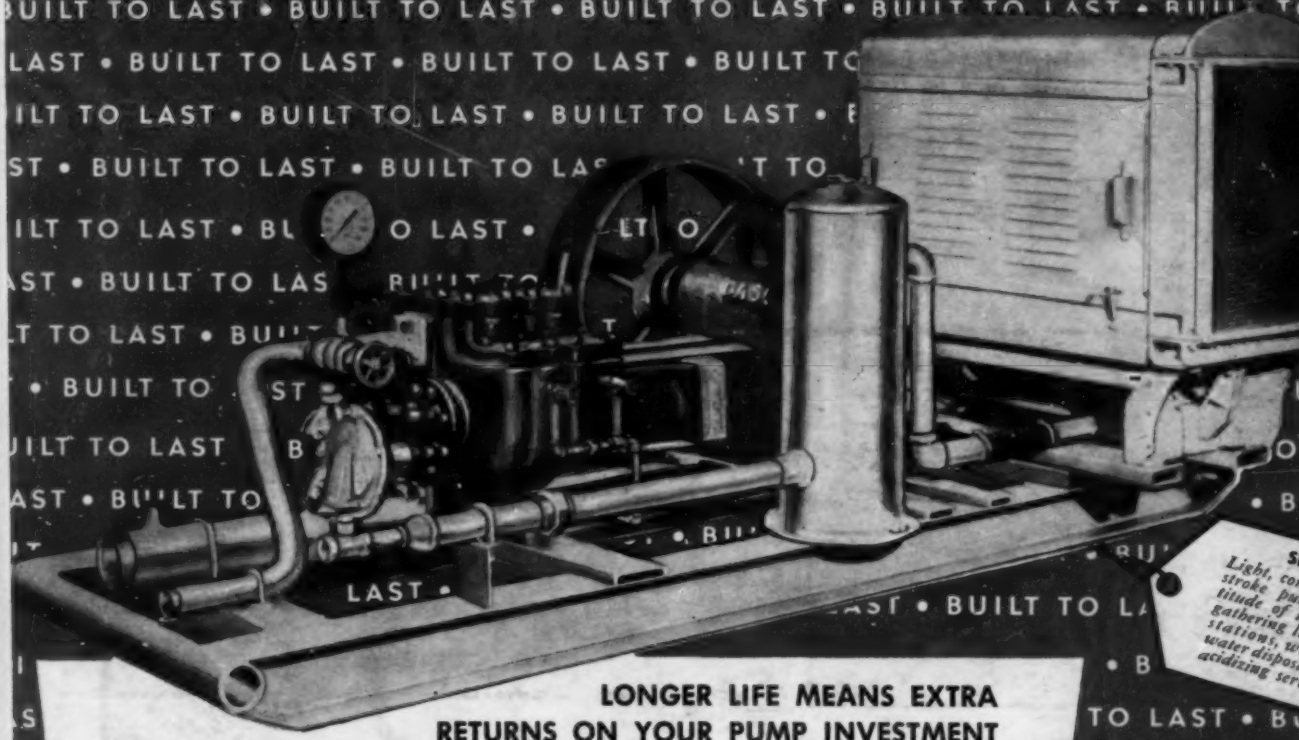
PIPE LINE INDUSTRY

CONSTRUCTION

OPERATIONS

MAINTENANCE

BUILT TO LAST • BUILT TO LAST • BUILT TO LAST • BUILT TO LAST • BUILT TO LAST



SERIES 1800

Light, compact, complete 6" stroke pumps with a multitude of uses in crude oil gathering lines, and booster stations; water lines, salt water disposal, slush service, acidizing service, etc.

LONGER LIFE MEANS EXTRA RETURNS ON YOUR PUMP INVESTMENT

BUILT TO LAST

What's back of the stories you hear pipe line men tell about the incredibly long life and low upkeep cost of their Gaso Pumps? *Engineering.* Engineering developed and perfected through nearly 40 years' concentration! Engineering that starts with special molybdenum alloy cast-iron and extends to every detail of every part. Engineering that includes herringbone gears, alloy steel cranks, extra-large roller bearings, babbitt-lined shell bearings, extra-deep stuffing boxes and positive flood lubrication. *Engineering that increases the return on your investment by assuring more years of top performance!*

GASO PUMP & BURNER MFG. CO. TULSA, OKLAHOMA
EXPORT OFFICE: 149 Broadway, New York

LUFKIN MACHINE CO., Ltd., Edmonton, Alberta
W. L. SOMNER COMPANY, Shreveport, Louisiana
Tinsley, Mississippi • Brookhaven, Mississippi • Odessa, Texas
POWER PUMPS, INC., Long Beach, Calif.
PEDDLERS, INC., Houston, Texas
NORTEX ENGINE & EQUIPMENT CO., Wichita Falls, Texas
LUFKIN FOUNDRY & MACHINE CO., Casper, Wyoming

GASO PUMPS
for every oil industry need

BUILT TO LAST • BUILT TO LAST • BUILT TO LAST • BUILT TO LAST • BUILT TO LAST